AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING

CIVILIAN AND DEFENSE

In This Issue . . . New Willys-Overland Car · · · Gas Turbines for Small Aircraft · · · Tank Engine Crankcases · · · Increasing Use of Refrigeration · · · · Rockets for Bazookas · · · AI Renegotiation Conferences

JANUARY 1, 1952

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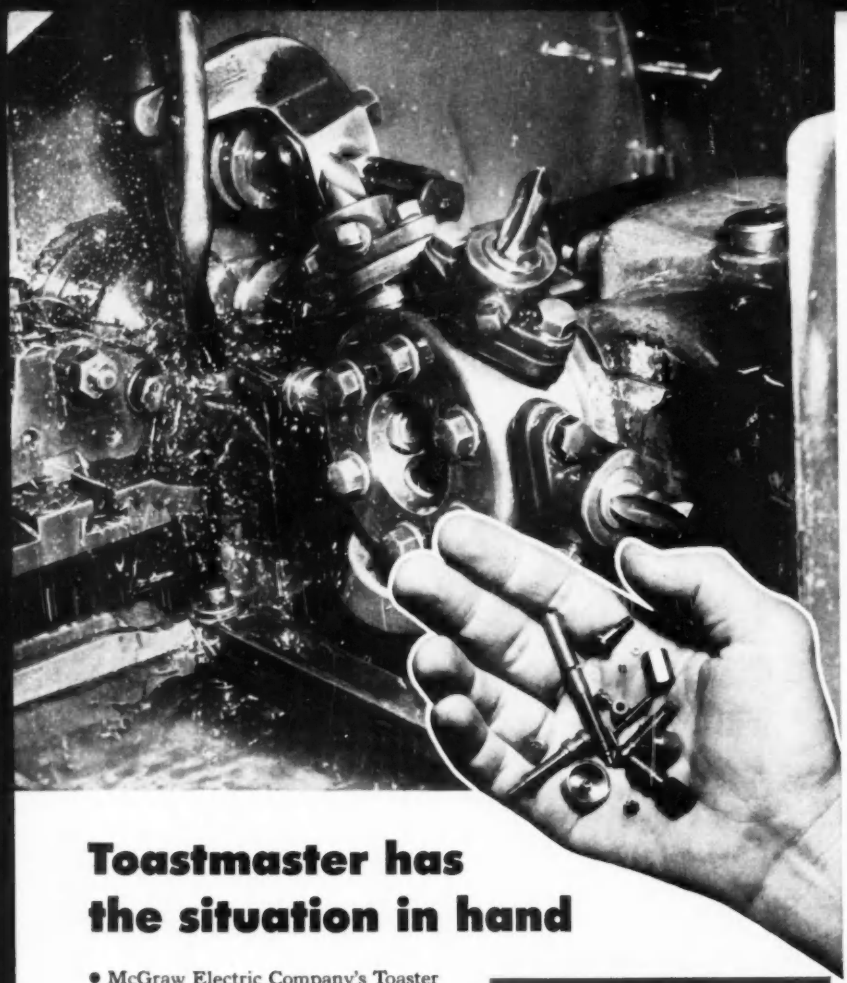
A CHILTON PUBLICATION



Toastmaster has the situation in hand

• McGraw Electric Company's Toaster Products Division at Elgin, Illinois, settled the cutting oil question ten years ago with the adoption of THIO Cutting Oil. This coolant is now widely used in the production of ferrous and non-ferrous parts in Toastmaster's automatic screw machine departments.

Satisfactory tool life has been one advantage of using THIO Cutting Oil. The quality of the finish produced has been of particular importance, however, since additional special finishing operations have been eliminated. The whole range of parts, from a .020 inch thick washer to a 25½ inch long bar, are ready for assembly as they come from the automatics.

In short, Toastmaster has the coolant situation well in hand. To develop a similar case in your own screw machine or grinding departments, or in your press-room, call for the services of a Standard Oil lubrication specialist. He knows your problems and can recommend a Standard Oil product to help you solve them. You can contact him at your nearest Standard Oil office, or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

THIO
TRADE MARK
Cutting Oil

What's your problem?

William Voegeli, of Standard Oil's Joliet office, has worked closely with McGraw Electric Company for several years – helping to maintain the high standard of quality that THIO Cutting Oil is making possible on automatic screw machine work.

Like all Standard Oil lubrication specialists, he has a broad background of practical experience plus thorough training in Standard's own schools. And like all lubrication specialists, his on-the-job assistance is always available to the industries in the immediate area he serves. He is one of a corps of experienced men who make their headquarters wherever industry is located throughout the Midwest. Call for the services of your Standard Oil lubrication specialist today. When he stops at your plant, be sure to get information on these outstanding products:

STANICOOL HD Soluble Oil – Because they contain additional compounding, these heavy-duty soluble oils possess not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

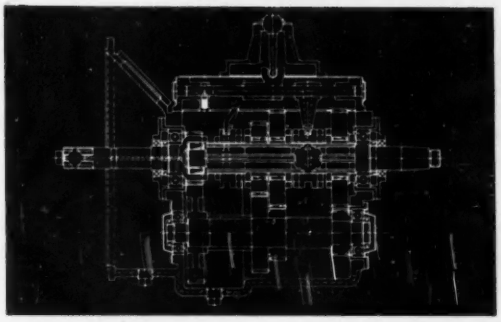
STANOSTAMP Compounds – Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work. These compounds can be removed readily in conventional washing equipment.

STANDARD OIL COMPANY

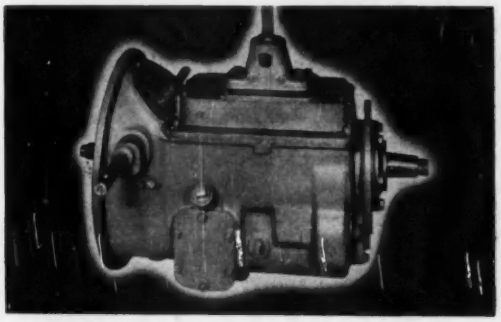
STANDARD *(Indiana)*

Engineered TO ORDER

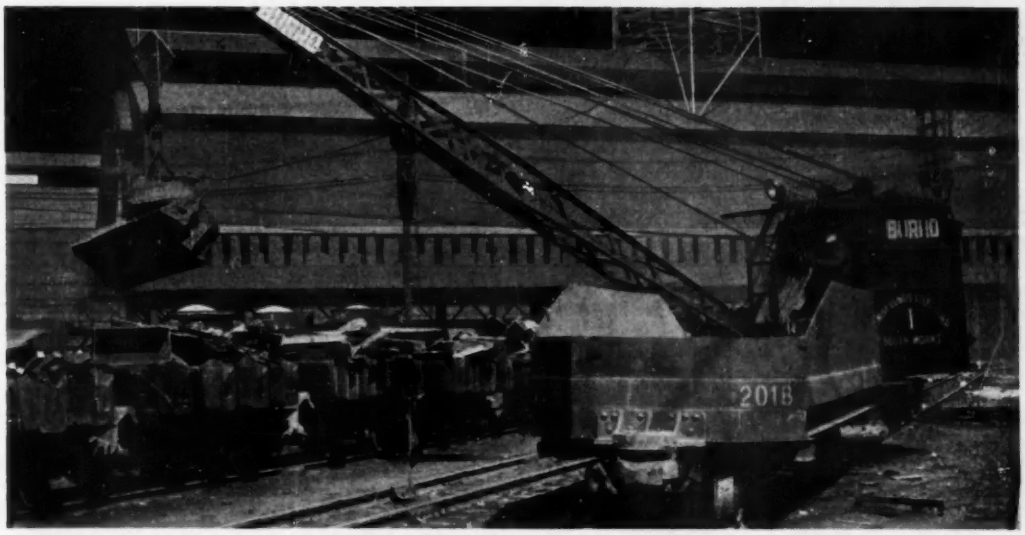
FOR BURRO CRANES MADE BY CULLEN-FRIESTEDT COMPANY, CHICAGO



For Cullen-Friestedt: a four-speed heavy-duty transmission, to give continuous trouble-free performance in locomotive cranes. Specially designed and built for Burro Cranes by COTTA.



Engineered-to-order: constant-mesh transmission is selective-type, with helical gears . . . for the grueling day-by-day operation of a locomotive crane. Precision-built in every detail.



The special narrow-gauge Burro crane shown above was built by Cullen-Friestedt for Carnegie Illinois Steel Corp. Burro crane *transmissions* are "special," too . . . designed by COTTA engineers to meet specific space limitations. They're typical of COTTA unit installations in all kinds of heavy-duty equipment. Write us for details.

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

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HEAVY-DUTY
TRANSMISSIONS

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NICKEL ALLOY IRONS
develop improved properties
plus all the basic advantages of plain cast iron

PLAIN GRAY IRON is, structurally, a steel matrix containing graphite flakes. Engineering, physical, processing and service properties are wholly dependent upon the character and disposition of these flakes, and upon the nature of the matrix.

The matrix of nickel alloyed irons closely resembles the pearlitic matrix found in high carbon steels, whereas the matrix of ordinary plain iron resembles that found in low carbon steels. Compositions of nickel alloy irons can be adjusted to reduce "chill" in thin sections without risk of forming "spongy" regions in heavy sections. This promotes uniform strength, improved machinability, pressure tightness and wear resistance.

Hardness in nickel cast irons results from improvement of the matrix. Chilled areas and hard carbides, which impair machinability, are obviated. Nickel improves response to heat treating. In fact, use of nickel alone or with other alloying elements plays an important part in meeting a variety of requirements.

Accordingly . . . nickel alloyed irons permit production of castings with high levels of the following properties:

Strength

Tensile and transverse strengths of castings are greatly increased by the addition of nickel to cast irons of properly adjusted base mixture. The ratio of compressive strength to tensile strength is retained. Greater uniformity of strength in thick and thin sections is achieved.

The International Nickel Company, Inc.
Dept. A.I., 67 Wall St., New York 5, N. Y.

Please send me booklet entitled, "Guide to the Selection of Engineering Cast Irons."

*Name*_____ *Title*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

EMBLEM OF INCO SERVICE TRADE MARK

Elasticity

The elastic modulus increases with strength. In this respect nickel-containing irons of the high strength type possess good stiffness and do not deform permanently under loads that would be damaging to irons of lower elastic modulus.

Damping Capacity

The damping capacity inherent in gray cast iron is not impaired by the presence of nickel.

Wear Resistance

The uniformly pearlitic matrix of nickel cast irons appreciably improves wear resistance. The uniformly fine graphite flake distribution, achieved in suitably processed irons *without formation of a poor wearing dendritic condition,* affords optimum resistance to wear and galling.

Pressure Tightness

Characterized by dense grain structure and fine dispersion of graphite throughout, nickel alloy irons are close-grained and offer an extraordinary degree of pressure tightness under high hydrostatic pressures, without sacrificing machinability.

Applications

Heavy machinery frames and *beds* are typical of cast parts that benefit from the rigidity and good damping capacity of nickel cast irons. *Cylinder* and *pump liners, gears, dies, machine tool ways, saddles* and *tables* exemplify parts produced in nickel irons to assure greatly increased strength and wear resistance. And nickel alloyed iron is used for *heavy duty brake drums* to resist heat checking, thermal shock, wear and galling. The nickel cast irons are readily heat treated, and respond particularly well to flame and induction hardening.

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of engineering nickel cast irons for many end uses in defense and defense supporting industries.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

January 1, 1952 Vol. 106, No. 1

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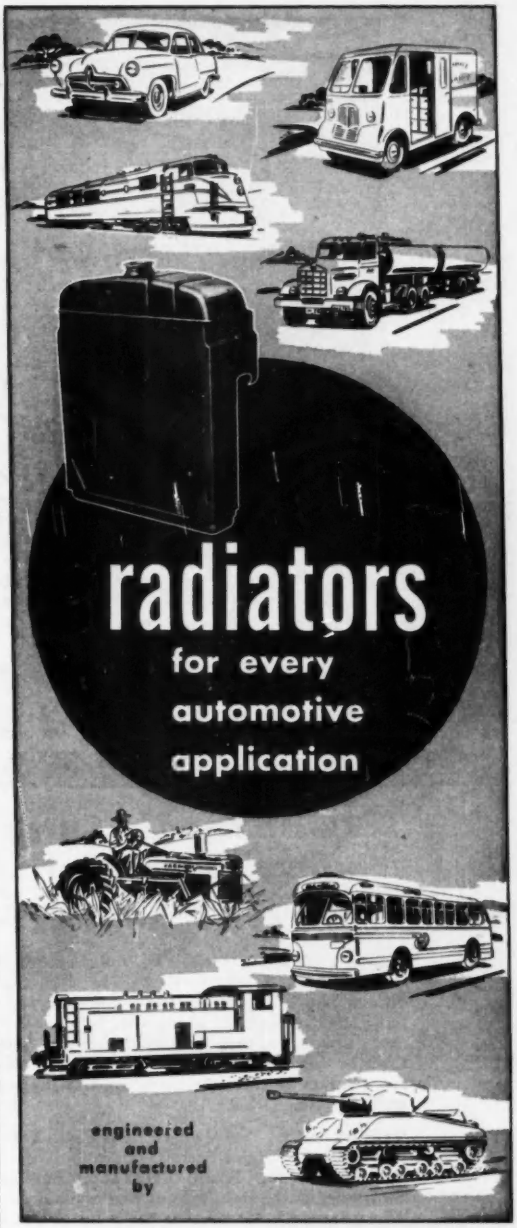

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3 Typical Examples of GREATER OUTPUT ...REDUCED COSTS

. . . with Texaco Cutting Fluids and Lubrication Engineering Service

*EXAMPLE No. 1: *130% Greater Production between tool grinds.* Steel pump parts were being machined on automatics. When *Texaco Cleartex Cutting Oil* replaced a competitive fluid, production between tool grinds more than doubled. Moreover, *Texaco Cleartex Cutting Oil* could be used as both coolant and machine lubricant, eliminating contamination and oil wastage.

*EXAMPLE No. 2: *75% Longer Drill Life.* The job was drilling shotgun barrels. Short tool life was overcome by the Texaco Lubrication Engineer's knowledge of the right *type* of cutting fluid to use. When *Texaco Sultex Cutting Oil* went on the job, tool life nearly doubled and downtime for tool changes was greatly reduced.

*EXAMPLE No. 3: *Chaser Life Doubled.* In threading stainless steel packing nuts the greatest difficulty was frequent chaser breakage. Change to *Texaco Cleartex Cutting Oil* increased chaser life from three to six shifts. In addition, both steel and brass can now be worked without changing oil. *Texaco Cleartex Cutting Oil* does not stain.

Whatever the metal being worked or your method of machining it, there is a *Texaco Cutting, Grinding or Soluble Oil* to enable you to do the job better, faster, at lower cost. A Texaco Lubricating Engineer will gladly work with you.

To keep your hydraulic mechanisms free from sludge, rust and foam, use *Texaco Regal Oil (R&O)* — turbine-quality oil that gives extra protection, reduces maintenance costs.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y. *Name on request

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

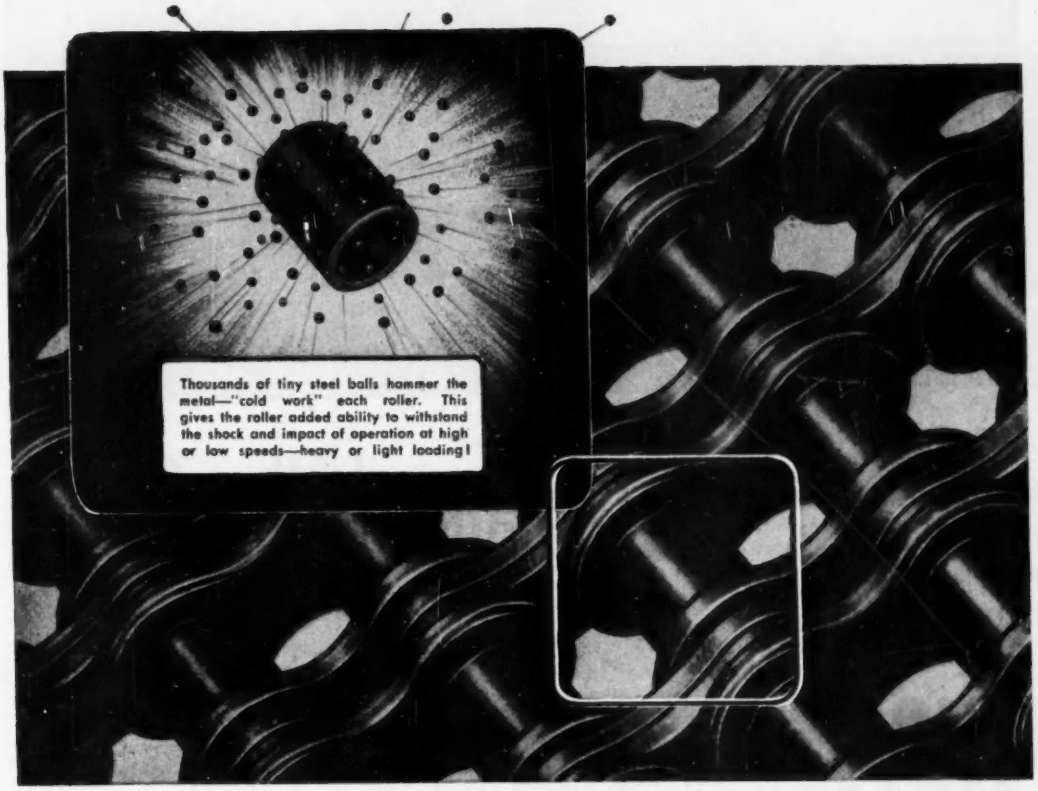
Faithfully yours 50 *for Fifty Years*

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

Get the roller chain with rollers that are

SHOT PEENED

for EXTRA fatigue life!


Thousands of tiny steel balls hammer the metal—"cold work" each roller. This gives the roller added ability to withstand the shock and impact of operation at high or low speeds—heavy or light loading!

You get this added feature in every LINK-BELT Roller Chain

You get absolute uniformity, too. No highs. No lows. Just smooth, flowing dependable chains that pay off in wide flexibility—greater performance—longer life.

You see, LINK-BELT Roller Chains are made from carefully selected materials with controlled heat treatment to assure uniformity and absence of weak members, then—rollers are shot peened to give them the extra fatigue life needed for today's higher speeds and heavier loads.

Link-Belt Roller Chain is available in single or multiple widths, in $\frac{3}{8}$" to 3" pitch and double pitch. If you have a roller chain problem, see the LINK-BELT engineer nearest you.

12,207

LINK-BELT

ROLLER CHAINS and SPROCKETS

LINK-BELT COMPANY, Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities.

New Balanced-Alloy Steels

80B00
TS8100
81B00
TS8600
TS94B00
4100 INT

The new series of balanced-alloy steels recently approved by the American Iron and Steel Institute are now being made by Bethlehem.

They are designed primarily to save nickel and molybdenum that are urgently needed for certain defense applications.

The new balanced-alloy steels are being used to replace some of the older and better known alloy grades such as: 2300 Nickel, 3100 Nickel-Chromium, 4100 Chromium-Molybdenum, 4600 Nickel-Molybdenum, 8600 and 8700 Nickel-Chromium-Molybdenum steels.

If you have any problems concerning the use of the new balanced-alloy steels, or if you need information on the selection, treatment and machining of steels for defense work, our metallurgists will be glad to help. Phone or write for this service.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM ALLOY STEELS

BETHLEHEM STEEL

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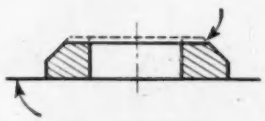
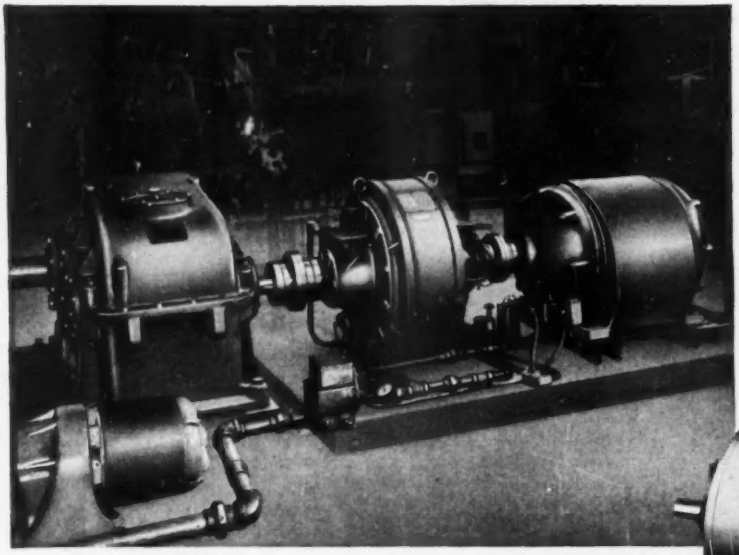
How to keep down the cost of ring-shaped gaskets

High-cost practice	The reason	The remedy
Requiring extreme accuracy in machine-finished shapes, such as beveled rings. 	Tools for beveling are indexed from base of part. Angle can be held accurately, but width of bevel will follow variations in thickness of sheet stock from which blank is cut. Extra processing is required to minimize these variations.	Find out what your supplier's standard tolerances are for producing the part by minimum-cost methods. Try these before requiring tighter limits.
Shaping parts to mate with fillets or radii on metal parts.	Unless part is molded, such features mean extra manufacturing operations.	Most resilient gasket stocks will deform or compress sufficiently to conform to flange contours without pre-shaping. In some cases, it may be possible to use a lower-cost broken corner rather than a finished radius or chamfer.
Requiring vertical edges on resilient washers and rings.	Die-cutting soft or easily compressible gasket materials produces concave walls in the finished washer or ring, especially in thicknesses over ⅛". Vertical edges can be made, of course, but washers made this way generally are higher in cost than simple die-cut washers.	Don't insist on vertical edges on resilient washers and rings unless they are necessary. Vertical sides may be needed in some cases . . . for example, where the O. D. of the ring is the sealing surface. Otherwise, they may be an unnecessary expense.

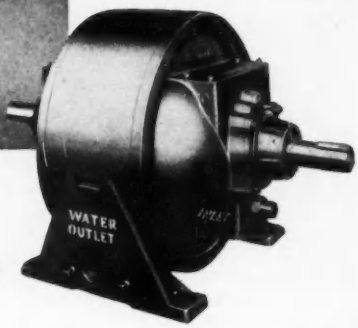
You'll find other helpful information on the design and use of gaskets in "Armstrong's Gasket Materials." This 24-page manual discusses subjects such as designing gaskets to reduce cost . . . designing flanges for efficient sealing . . . the effect of surface condition on gaskets, and many others.

You'll find, too, up-to-date information on Armstrong's various sealing and friction materials. Included are government and SAE-ASTM specifications. See this manual in Sweet's file for product designers. For a personal copy, write Armstrong Cork Company, Gaskets and Packings Dept., 1501 Arch Street, Lancaster, Pennsylvania.

ARMSTRONG'S *Gasket Materials*



Model 6-W Dynamatic Water-Cooled Coupling driving a calender in a large rubber manufacturing plant. Power is transmitted from AC motor, 100 H.P., 1200 RPM.



ELECTRO-MAGNETIC
DYNAMATIC
EDDY-CURRENT

WATER-COOLED POWER COUPLINGS

Provide Adjustable Speed Drive Direct from AC

The Dynamatic Coupling transmits rotation from a driving to a driven member without mechanical contact—with stepless adjustable control and with almost instantaneous response. It is a simple and effective method of providing adjustable speed from a constant speed source (or vice versa) with full-torque starts. The addition of an eddy-current brake will provide smooth controlled deceleration.

Effective water-in-the-gap cooling makes possible large capacity in small space, and the construction provides complete protection of the interior of the coupling against atmospheric impurities.

A standard range of sizes of Dynamatic Water-Cooled Couplings is available for transmitting torques of 50 pounds feet up to approximately 5,000 pounds feet. Many other sizes up to and including single units for handling 200,000 pounds feet of torque are in service and units of larger capacity can be built to order.

Write for Illustrated Bulletin WC-1.

WIDE SPEED RANGE

INSTANTANEOUS RESPONSE

ACCURATE SPEED CONTROL

STEPLESS SPEED ADJUSTMENT

SMOOTH TORQUE TRANSMISSION

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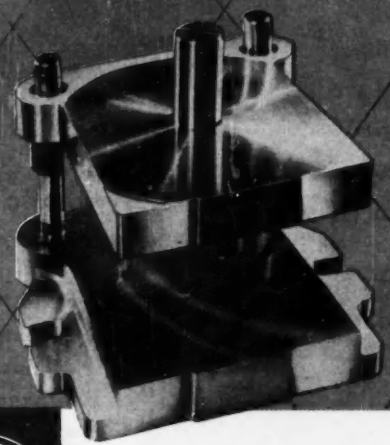

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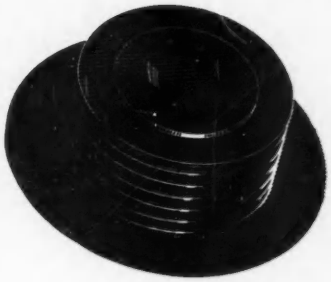
You save time when you "tool up" with Danly Die Sets . . . preferred by diemakers everywhere. Check the unique precision features that mean faster die completion and longer production runs . . . see how the nationwide system of Danly assembly branches reduces costly delivery delays. Write for your copy now . . . Danly Die Sets are certain to help you meet production schedules.

DANLY

DANLY MACHINE SPECIALTIES, INC. 2100 South Laramie Avenue, Chicago 50, Illinois

insist on "buried" integrity in your products

In the durable goods field most of the products are composed of many component parts. Acadia Synthetic Rubbers are contributing importantly to the superiority of thousands upon thousands of these products on land, sea, and in the air—from battleships to tiny instruments. For years manufacturers in hundreds of industries have found by experience that, with Acadia Synthetic Rubber parts in their products, they will never have trouble from that source. Acadia is a "buried" but vital component for products of highest integrity. Insist upon it!



• for every synthetic rubber requirement

- sheets
- tubing
- strips
- channel
- washers
- seals
- bellows
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- cut parts

Resists oil, age, wear, heat, light

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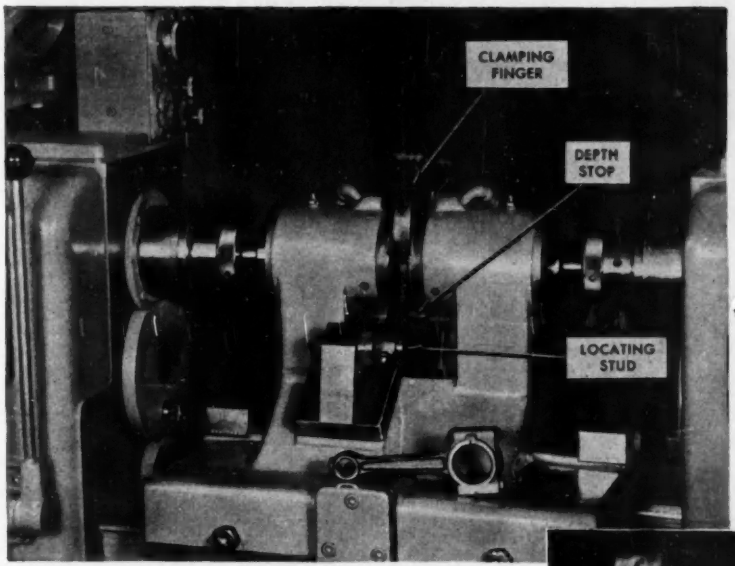
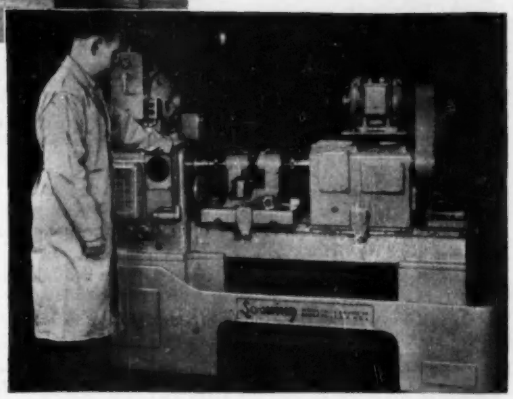
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



Model "CS" Lo-swing Automatic Drilling and Centering Machine Cuts Costs on Chamfering Connecting Rod Main Bearings



Problem: To automatically chamfer both sides of connecting rod main bearings. Chamfer must be smooth and free from chatter marks.

Solution: The Model "CS" Lo-swing Automatic Drilling and Centering Machine selected for this job, is equipped with one fixed and one adjustable drilling and centering head and a special automatically-operated holding fixture. The holding fixture, shown in the close-up illustration is fitted with a locating stud which holds and locates the connecting rod on the wrist pin hole. After mounting the part on this stud, it is necessary only to swing the large end of the connecting rod between two hardened steel bushings which hold the rod endwise, and a depth stop positions the hole axially with the chamfering cutters.

The air-operated clamping finger, shown just above the connecting rod, is automatically operated through an air valve controlled from the feed mechanism and is automatically closed when the machine is started and automatically opened at the end of the machine cycle.

The machine cycle is entirely automatic; the operator simply loads the parts and pushes the starting lever which also actuates the clamp. The chamfering cutters advance in rapid traverse to the cutting position, slow down for feed and then return in rapid traverse to the starting position, where the clamp is automatically opened.

Principal production advantages are:

1st. Operator cannot forget to clamp the work as it is automatically clamped.

2nd. Operator is free to run other machines due to the rapidity of loading and unloading.

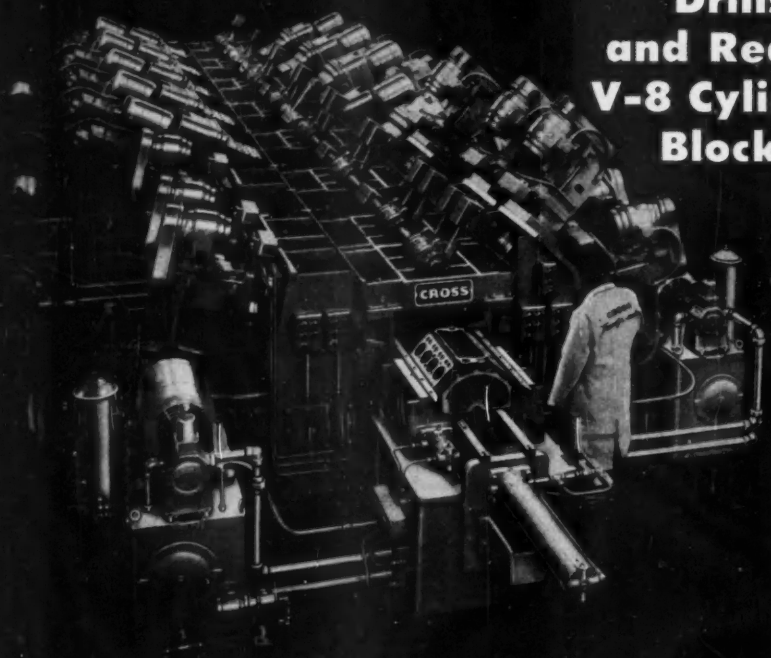
3rd. Amount of chamfer is constant. Stroke controlled by positive path cams.

4th. Production on an average size connecting rod is 300 pieces per hour!!!

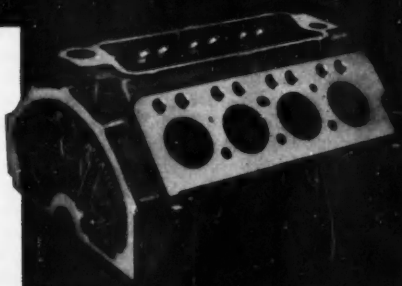
PRODUCTION COSTS ARE LOWER WITH Lo-swing

Another Transfer-matic by Cross

Drills and Reams V-8 Cylinder Blocks



- ★ Drills and reams dipstick hole; drills oil feed holes for heads; rough and finish reams tappet holes on 82 cylinder blocks per hour at 100% efficiency.
- ★ 15 stations: one loading, three drilling, four reaming, one cleaning and six inspection.
- ★ Automatic transfer from station to station.
- ★ Automatic gravity operated cam clamping.
- ★ Other features: Construction to J.I.C. standards; hardened and ground ways; hydraulic feed and rapid traverse; a coolant system; chip conveyor for automatically moving chips to a central disposal point; automatic lubrication.



Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Eaton Free-Valves

can be applied to engines of all types and sizes–in production or in the field–without engine design changes

Eaton Free-Valves prevent the formation of stem deposits or uneven seat deposits; prevent local overheating, eliminating the principal causes of guttering; prevent valve stem sticking or scuffing. As a result, Eaton Free-Valves last many times longer. These benefits can usually be applied to an engine without costly design changes. Eaton Free-Valve Kits for motor cars, trucks, and tractors are available from dealers.

You can utilize Eaton's long experience in this field by giving our engineers an opportunity to work with yours in the early stages of design.

EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

VALVE DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

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THE INDUSTRY'S FINEST POWER BRAKING SYSTEMS

on Highways Everywhere!

Regardless of the size of vehicle or whether the preference is for vacuum or air, the trucking industry has come to look to Bendix Products as the one source uniquely qualified to meet every power braking need.

Hydrovac, the world's most widely used power brake, is the undisputed leader in the vacuum-hydraulic field. And Air-Pak is recognized as foremost in the field of air-hydraulic power braking units.

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That's why on highways everywhere the preference is for Bendix Hydrovac® or Bendix Air-Pak, the industry's Finest Power Braking Systems.

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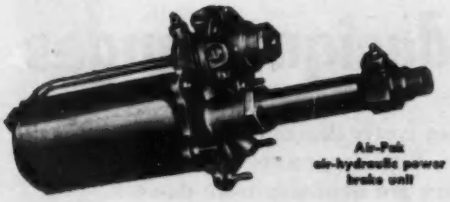
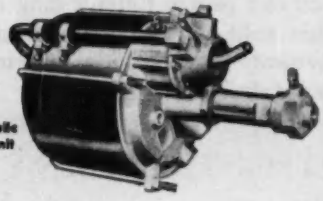
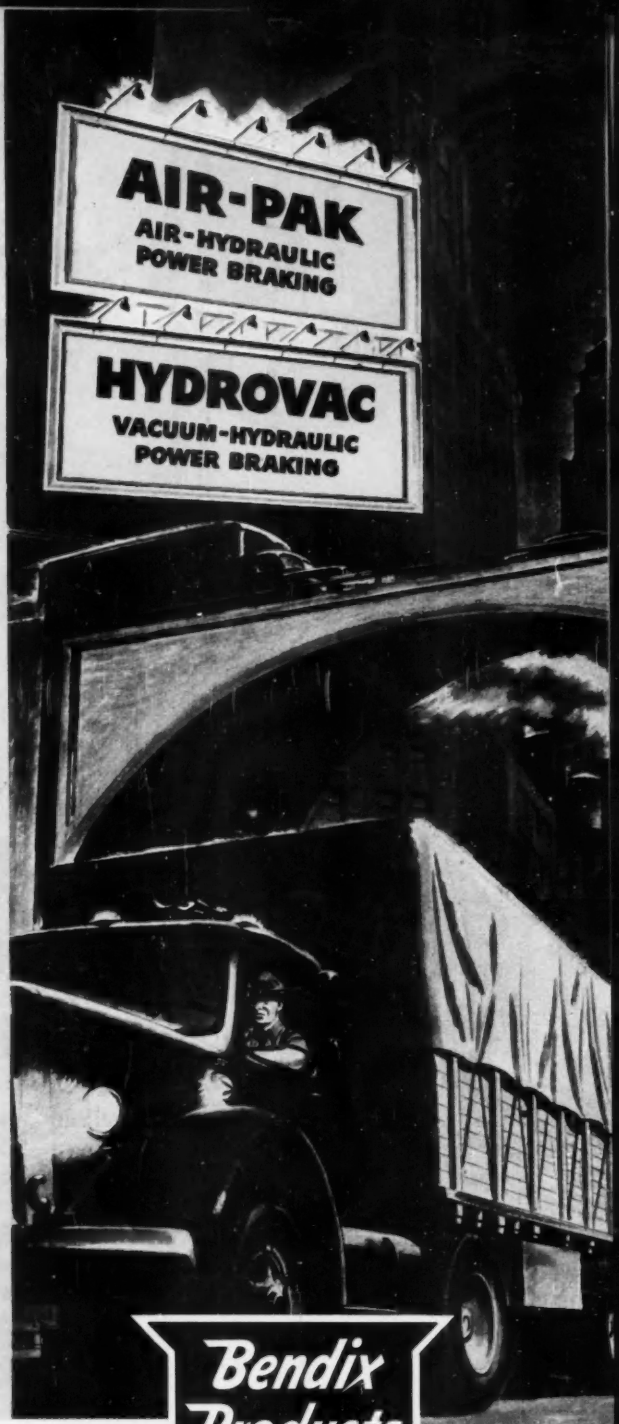


Air-Pak air-hydraulic power brake unit



Hydrovac vacuum-hydraulic power brake unit



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High Spots of This Issue

Rockets for Bazookas

Volume manufacture of 3.5 in. rockets used in latest type bazooka weapons now in service in Korea is among the many military projects undertaken by Ford. Here is described and illustrated the meticulous production of highly critical rocket parts. Page 34.

New Willys-Overland Passenger Cars

The dramatic news from Willys-Overland is the announcing of a line of passenger cars for 1952, after practically an absence of ten years from the passenger car field. Specifications, engine drawings, and photographs accompany this article on the car's mechanical features. Page 38.

Gas Turbines for Small Aircraft

How gas turbines are necessary for small aircraft progress is pointed out by the author of this article. An interesting and informative evaluation of aircraft propulsive systems is presented. See page 46.

Heat Treatment of Steering Gear Parts

This account, concerning high production heat treatment of over 850,000 lb of steering assembly parts each month at Ross Gear & Tool Co., discusses in detail operations on the worm or cam, the lever shaft with studs, and steering arm with ball. Page 50.

Renegotiation Problems Analyzed

As an editorial extension service over the past four months, AUTOMOTIVE INDUSTRIES has held conferences for management men in a number of major cities. They have proved excellent meeting grounds at which company executives could analyze their renegotiation problems. Here is given pictorial coverage of the personalities there present, and a resume of the programs. Page 54.

22 New Products Items And Other High Spots, Such As:

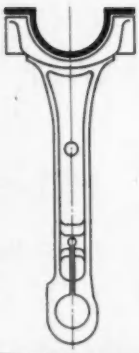
Vibration testing the Henry J body and frame; a two stroke Diesel of unique design; production of tank engine crankcases; the increased use of refrigeration in the aircraft industry; Metals; and design features of a small gas turbine for driving ship generators.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

HYDRO-BROACHING WITH AUTOMATIC FIXTURES

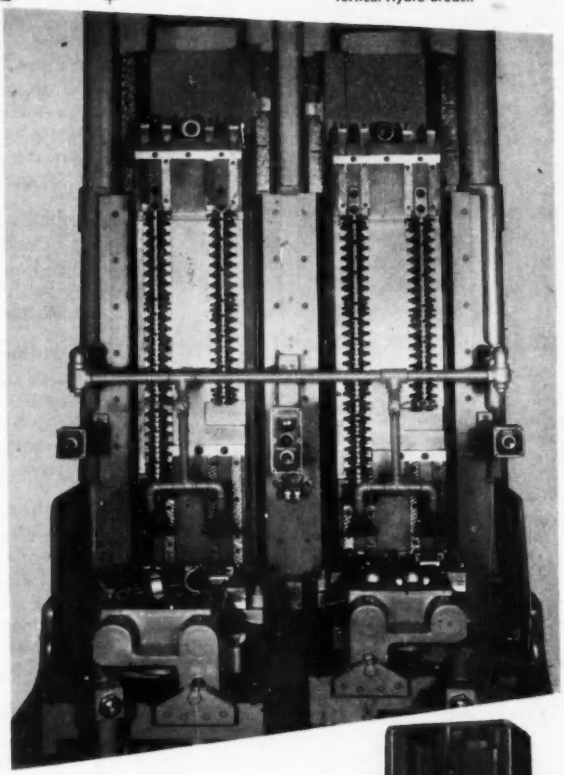
Note 290 sets of parts per hour



Drawing of connecting rod and cap broached on the All-Cincinnati equipment illustrated here:

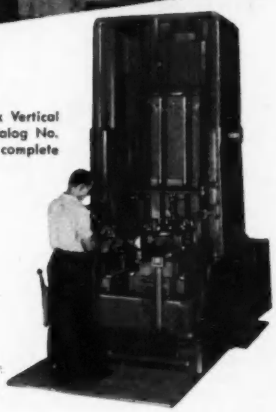
Part name ..... Connecting rod and cap
Material ..... Steel forging
Operation ..... Broach half bore and parting face
Depth of cut ..... 3/32"
Broaching speed .... 34 feet per minute
Production ..... 580 parts (290 pairs) per hour
Machine ..... CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach

Caps and connecting rods for automotive engines are usually required in large volume, and those broached on the equipment illustrated here are no exception. To meet the production requirements of 580 parts per hour (290 pairs) Cincinnati Application Engineers tooled up a No. 10-66 Duplex Vertical Hydro-Broach with two labor-aiding mechanically actuated automatic fixtures. Each holds one pair of parts—a cap and a rod. Clamping and unclamping are automatic... the operator is concerned only with positioning and removing the work. ¶ Several Hydro-Broach features contribute to the uniformly high production required for work of this type. Because of the alternating cutting cycles for the rams and tables, broaching is practically continuous; ways are hardened, ground and automatically lubricated for long productive life span; pre-set cycle control safeguards the operator. ¶ Our Application Engineers will give you the benefit of their experience in recommending and tooling up new CINCINNATI machines—milling or broaching—for the lowest cost production of your high priority work. And if you're not familiar with the new CINCINNATI Duplex Vertical Hydro-Broach Machines with receding tables, write for literature.



THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach. Write for catalog No. M-1709-1 which contains complete engineering specifications.



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MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 106, No. 1 January 1, 1952

Relaxed Rubber Controls to Bring Cheaper Tires

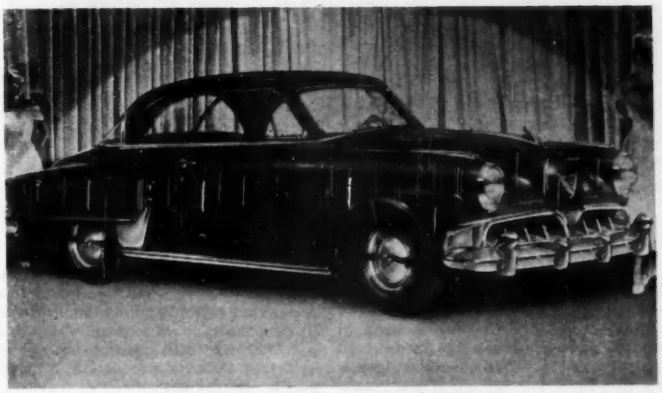
Second- and possibly third-line passenger car tires are expected to appear again on the market as a result of lifting of Government controls on synthetic rubber. Tire companies report that they have lost considerable business to recappers since the Government imposed restrictions banning manufacture of lower quality-line tires. Second-line tires are generally from 20 to 25 per cent lighter in weight and about that same percentage in quality below first-line casings.

The primary reason for easing the restrictions is the much improved supply of synthetic rubber, which is so good, in fact, that consideration is being given to exporting a considerable amount in 1952. There will be little effect on truck tires, which are made largely from natural rubber, unless controls on crude rubber are also relaxed. This is a distinct possibility.

Hudson Adds New Model to Its Line for 1952

The recently announced 1952 Hudson line consists of the Commodore Six and Eight, the Pacemaker, the Hornet, and a new model—the Wasp. Although similar in its physical aspects and appointments to the Hornet, the Wasp has the same wheelbase (119 in.) as the Pacemaker. It is powered by the basic 262 cu in., six-cylinder engine found in the current Commodore Six with an output of 127 bhp. Although the price of the Wasp has not yet been revealed, it is expected to be between that of the Commodore Six and Hornet and to compete with other cars in the medium-price class.

The entire series has been given fresh interior styling with new nylon fabrics and a decided accent on color harmony. External changes, in addition to redesigned roof and rear quarter panels to effect the appearance of hardtop styling, are new molding and decorative features. Tinted glass is offered as an optional feature.



THE 1952 STUDEBAKER STARLINER

Hardtop Convertible Features Studebaker Series for 1952

The new "Starliner" model above, a five-passenger, hardtop convertible, leads off the Studebaker series for 1952. Offered in both the Champion and Commander lines, it is available in 11 different two-tone combinations and two upholstery options. The entire series, as typified by the "Starliner," incorporates a number of design, styling, and mechanical changes.

Externally, the 1952 Studebakers reveal new front-end treatment (longer and lower hoods with new emblems and ornaments, wrap-around grilles and bumpers, and redesigned headlamp rims and parking lights and restyling in the rear (tail lights that appear incorporated in the fenders and a better balanced trunk lid). New upholstery and door trim patterns, bumper guards, instrument panel alterations, optional tinted glass, and enlarged rear windows on convertibles are other interior and exterior innovations.

Mechanical changes include: softer and easier brake action (altered pedal linkages, floating rear shoes, and stronger linings), push-button starting on automatic drive models, new type of starter for the Commander, moisture-proof ignition systems, and an increased generator output to 45 amps.

Government Nips Rumor of Car Tool Takeover

A report that the Government was tentatively planning to commandeer general purpose tools from the automobile industry for use by aircraft engine manufacturers has been thoroughly scotched. It is understood that the matter was broached at an Office of Defense Mobilization meeting but was promptly squelched. An ODM official is reported to have said that the automobile industry required its tooling for its own defense jobs.

Minnesota Ford Plant to Make Plane Parts

Ford Motor Co. is planning to convert part of its Twin Cities assembly plant facilities to production of wing spars for bombers. The company has an order to produce the parts for the Navy B-47 high-speed bomber, and production will begin within a few months.

News of the AUTOMOTIVE

THE 1952 PLYMOUTH CRANBROOK

1952 Plymouth Has Many Refinements

Said to feature 46 improvements in all, the 1952 Plymouth line includes 10 body types. Interiors have been embellished with a new variety of upholstery fabrics designed to blend with the carpeting and instrument and door panels. Exterior changes of note are: redesigned ornament, top molding, hood medallion, license light and name plate on the rear deck lid; a new stainless stone shield on the rear fender; and a lowered rear fender molding. Tinted safety glass is offered on an optional basis.

Mechanically, the 1952 Plymouth contains a newly designed combustion chamber in its six-cylinder, 97-hp engine. Several refinements in the transmission are reported to effect easier shifting and better engagement of gears. Improved brakes and shock absorbers are added safety and comfort features. Greater starter and windshield wiper efficiency are the chief changes in the electrical system.

Willys Gets Fifth Army Jeep Order

Willys-Overland Motors, Inc., has received its fifth large order from the U. S. Ordnance Corps since 1949. The new contract is for military jeeps and spare parts. A large majority of the vehicles will be a new model designated as the M-38A1. According to Willys, it will feature more comfortable riding, a better appearance, greatly improved performance, and waterproofing for deep fording operations. Size of the order was not revealed, but indications are that it will add substantially to the present backlog of orders which has put Willys in 24th position among the principal defense production contractors in the country.

GM Reported to Be Leader Among Defense Contractors

For the fiscal year ending June 30, 1951, General Motors Corp. was the largest single holder of defense contracts with 8 per cent of the total, according to a recent report from the Munitions Board. GM military orders total more than $2.372 billion of the $30 billion worth of contracts awarded during the period. Its percentage was nearly twice as high as that of the second place company, United Aircraft Corp., with contracts for $1.228 billion, or 4.1 per cent of the total.

Remaining companies in the top ten are: Douglas Aircraft Co., Inc., $735 million; Grumman Aircraft Engineering Corp., $702.6 million; General Electric Corp., $654.2 million; Republic Aviation Corp., $650.4 million; American Locomotive Co., $607.8 million; Lockheed Aircraft Corp., $607.3 million; North American Aviation, Inc., $507 million; and Boeing Airplane Co., $482.2 million.

Other automobile and truck companies listed as holders of war contracts as of last June 30 are: International Harvester Co., $467 million; Chrysler Corp., $415.5 million; Ford Motor Co., $400 million; Willys-Overland Motors, Inc., $172.2 million; Studebaker Corp., $157.7 million; Reo Motors, Inc., $139.6 million; Kaiser-Frazer Corp., $91.7 million; Packard Motor Car Co., $87.7 million; Diamond T Motor Car Co., $75.1 million; Mack Manufacturing Corp., $62.7 million; and Fruehauf Trailer Co., $44 million.

Air Force Awards New Contract for Atomic Engine to P & W

The Air Force announced recently that is has awarded a contract to Pratt & Whitney Aircraft Div., United Aircraft Corp., to build an atomic aircraft engine. Details of the project were few, for Air Force officials refused to state when the new power plant was scheduled for delivery, the amount of money involved in the contract, or the type of aircraft for which the engine is intended. They did, however, reveal that the contract was entirely separate from the one awarded to General Electric Co. some months ago to develop a nuclear-powered engine for a plane to be built by Consolidated Vultee Aircraft Corp.

Chevrolet Shell Order Doubled by Ordnance

Chevrolet Div. of General Motors Corp. will add a second shift at the St. Louis, Mo., shell plant it is operating for Army Ordnance as a result of a new order doubling its original contract for artillery ammunition. The first contract was for more than $25 million. Chevrolet took over management of the plant last April 6 and turned out the first shell about 60 days later. More tooling has been installed, and production is expected to step up rapidly.

Thompson to Build Plant for Jet Parts in Canada

It is reported that Thompson Products, Ltd., will build a $4 million plant in Saint Catharines, Ont., for the manufacture of operating parts for jet aircraft engines. Under a contract with the U. S. Air Force, the company will deliver parts to U. S. and Canadian firms, and production will be started at the earliest possible date.

International Harvester to Build Garand Rifle

International Harvester Co. has received its first gun contract since World War II. The company has a multi-million dollar order to build the M-1 Garand semi-automatic rifle and is tooling its Evansville. Ind., plant for it.

AND AVIATION INDUSTRIES

Thompson to Take Lease on Lincoln Elec. Plant

It is reported that negotiations for the sale of the Cleveland, O., plant of Lincoln Electric Co. to Eddy-Coit Co., with immediate lease to Thompson Products, Inc., for the production of jet engine parts, have been almost completed. Selling price of the huge plant, which contains seven main buildings on 15½ acres of land, is said to be in the vicinity of $3 million. Under the terms of the proposed lease, Thompson will lease the factory for a five-year period with the option of renewal for an indefinite period.

Machine Tool Makers Get Top Priority

The National Production Authority recently implemented its announced intention to give machine tool producers top priority assistance in obtaining steel, copper, aluminum, and component parts. The agency has issued a new priority known as "Z-2" which carries the same priority rating as that granted to manufacturers of weapons and equipment for the armed forces and the Atomic Energy Commission. The old "N-8" priority symbol previously used by machine tool builders is superseded by the new Z-2 priority band.

Letters of authorization to use the new priority have gone forward to manufacturers of machine tools, metal working machinery, jigs and dies, gages and precision measuring tools, and accessories for machine tools. Upon receipt of the authorization, manufacturers can apply the priority immediately to orders already outstanding and also to new orders. The new priority, however, does not authorize any manufacturer to exceed authorized allotments of controlled materials.

Superior Flux Announces Copper-Cladding Method

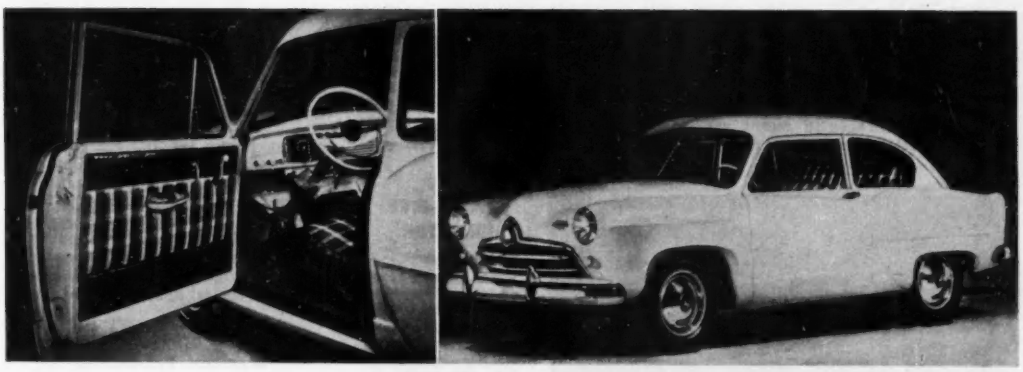
A new process, whereby copper is said to be inseparably bonded to steel, was demonstrated recently in Cleveland, O., by Superior Flux & Manufacturing Co. Developed by W. L. Ulmer of the aforementioned firm, the process reportedly makes possible the production of sheets 80 per cent steel and 20 per cent copper which combine the corrosion resistance of copper with the strength of steel and can be deep-drawn or otherwise deformed without danger of separation of the constituent metals.

The process produces a bonded bimetal by casting molten copper on heated steel slabs. A highly volatile, vaporizing, boron liquid flux called "Gasflux" is used to counteract the oxides resulting from such heating. It is said to overcome difficulties encountered in trying to make bi-metal by using solid fluxes which generally become trapped between the two metals and cause an imperfect bond.

According to the company, the process is adaptable for use in ordinary steel and brass rolling mills without the use of special equipment and can be used in the production of many civilian and military goods to conserve scarce copper supplies. It is reported that negotiations are now under way for the production of a substantial tonnage of copper-clad sheet made by the process and that attempts are being made to interest some agencies of the Government in it.

Bendix to Build Jet Starter

Bendix Aviation Corp. announced recently that it would start production in the near future of an airborne starter for jet plane engines. It is claimed that the starter will be the first manufactured to operate without ground crews or equipment. Production is to be centered at the Utica, N. Y., plant.



THE KAISER-FRAZER ALLSTATE

Pictured here is the Kaiser-Fraser Allstate to be sold by Sears, Roebuck and Co. in selected marketing areas in the South, Southwest, and West of the U. S. (see Dec. 1 issue of AUTOMOTIVE INDUSTRIES, p. 19). The car will be offered in standard and de luxe models with a choice of two high-compression, L-head engines, a four and a six. The former is said to deliver 68 hp and the latter 80 hp. Overdrive is available as optional equipment. Basic factory delivered prices, which include Federal, but not state taxes, will range from $1395 for the standard four-cylinder model to $1796 for the de luxe six-cylinder model equipped with overdrive. The overall length is 176⅝", the overall width 70", the wheelbase 100", and the GVW about 2293 lb for the four-cylinder model and 2341 for the six. A special feature of the Allstate is washable, fade-proof, and stain-resistant plastic upholstery (see left photo) available in numerous patterns and colors. The cities in which the car will be sold at retail are: Birmingham, Ala.; Knoxville and Memphis, Tenn.; Richmond, Norfolk, and Portsmouth, Va.; Fayetteville, N. C.; Jackson, Miss.; Orlando, Fla.; Little Rock, Ark.; San Antonio, Houston, Baytown, Beaumont, Waco Lubbock, and Dallas, Tex.; and Phoenix, Ariz.

News of the AUTOMOTIVE

Navy Aids in Breaking Machine Tool Delays

The Navy has announced a program designed to aid in breaking machine tool bottlenecks in defense production. Several defense contractors are now having machine work done at the New York Naval shipyard, among them Chrysler Corp. on 16 T43 tank hulls for its Newark, Del., plant. The yard is also undertaking a job of machining parts for Cincinnati Milling Machine Co. Contractors on defense work should make arrangements through their Army and Air Force contracting officer for use of Naval facilities to meet machining, forging, and foundry work requirements that cannot be satisfied in private plants.

Black Losing Favor of Pontiac Buyers

For the third consecutive year, black has slipped substantially in color preference among Pontiac buyers, according to L. W. Ward, the division's general sales manager. The first year that black dropped from first choice was 1949. The following year it was still in second place by a narrow margin and in 1951 was a very poor third. First choice color last year was dark green, with number two position occupied by light blue. Mr. Ward said that the choice of the brighter colors not only reflects the prosperity psychology of the public today, but also shows the results of much improved paints, color schemes, and interior trims. Two-tone color combinations also have shown notably increased percentages in recent years because of better harmony and contrast.

AIRBORNE AMBULANCE

Shown here is the Sycamore 10, ambulance version of the British Bristol Type 171 single-rotor helicopter. Two large detachable blisters have been incorporated on the fuselage to house stretchers, and the plane's normal sliding doors have been replaced by hinged ones. The plane may also be used for communications operations.

Steel Makers Reach New Yearly Record

The steel industry passed a record milestone Dec. 13 when it poured the 100 millionth ton of steel to be produced in 1951, the first time in history that the industry has produced 100 million tons in a single year. In 1950, total production was 96,836,075 ingot tons. Meanwhile, steel industry spokesmen are taking issue with government officials who have expressed skepticism about any possible increase in steel production before late in 1952. Steel men say that, as of the first of this year, capacity was 107 million tons, that 2.9 million tons will be added in the first quarter, 3.7 million in the second quarter, and three million in the third quarter.

RAPID-FIRE RIVETER

An automatic, double-setting, high-speed riveter, seen in operation at Ford Motor Co.'s plant in Milford, Mich., has a 12-station indexing rotary fixture and rivets the throttle plate to the shaft assembly of Ford carburetors with four rivets. The machine, which replaces a four-spindle screwdriver machine and rivets 4189 assembly units in eight hours, was built by Chicago Rivet and Machine Co.

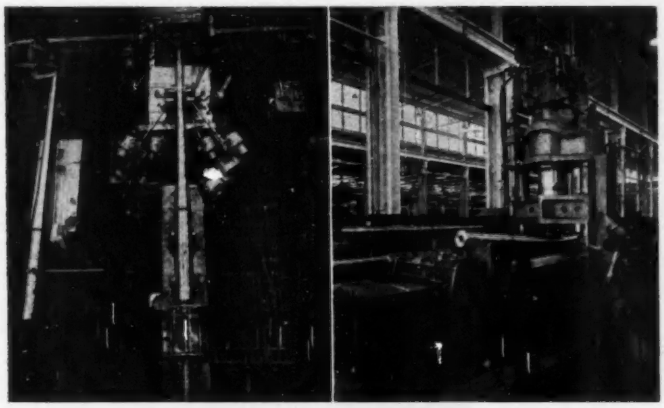
OPS Raises Ceilings on Car Accessories

The Office of Price Stabilization has granted a 3.5 per cent increase in ceiling prices for extra, special, or optional equipment on automobiles. The increased ceilings for such equipment are in line with those for automobiles, since prices on extra equipment remained unchanged last March when a 3.5 per cent boost for passenger cars was approved. The new increase applies to such items as heaters, radios, seat covers, extra lights, automatic transmissions, and special upholstery and colors.

Kaiser-Frazer Begins Mexican Production

Kaiser-Frazer de Mexico recently started operations in Mexico, where it will turn out cars for sale in that country and other Latin American nations. The assembly plant covers a large area and contains the latest modern equipment. It was erected in the record time of 100 days, and during this period all necessary machinery and equipment was shipped from the U. S.

AND AVIATION INDUSTRIES



FIREPOWER PRODUCTION

The two photos above show interesting operations being performed on the 90mm tank gun being built by Oldsmobile Div. of General Motors Corp. at its gun plant in Lansing, Mich. At the left, a drilling operation is performed while an employee inspects the interior of one of the tubes which are being built for the Army Ordnance Corps. At the right, a 1000-ton hydraulic straightening press applies pressure to a gun tube. It may bend as much as 10 in. during machining operations but does not break because of the special steel from which it is made.

Olds Modifies Cars for Injured Vets

Oldsmobile Div. of General Motors Corp. has reinstituted its "Valiant Car" program for the benefit of amputees and paraplegics of the Korean war. During World War II Olds built about 30,000 of the vehicles, which are equipped with Hydra-Matic transmissions and special controls designed to permit a veteran who has lost the use of one or more members to drive the car. The Army and Navy helped to develop the special controls, and new federal legislation provides most of the purchase price of cars thus equipped to qualified veterans. Oldsmobile presently is making its Valiant cars available to veterans' hospitals for training.

NPA to Permit More Trailers In Second Quarter of 1952

Three recent actions of the National Production Authority are of noteworthy interest. First, NPA stated that it will request an allotment of materials sufficient to permit the construction of 16,000 truck trailer units in the second quarter of 1952. This would be 1500 more units than were approved for the first quarter and would be in addition to the mounting military demand for trailers. Whether or not the request to the Defense Production Administration is granted depends, of course, on the availability of controlled materials.

Second, NPA amended its basic machine tool order, M-41, to provide that machine tools covered by Government pool order contracts may not be diverted, after Feb. 1, 1952, to fill non-priority rated orders.

Third, NPA appointed Otis Howard, manager of operations, Oklahoma Gas & Electric Co., to be director of the Engine and Turbine Div. This unit is responsible for distributing allotments of steel, copper, and aluminum under the Controlled Materials Plan to manufacturers of heavy power equipment.

BLS to Continue Old Price Index

The decision by the Bureau of Labor Statistics to continue with the present consumer price index for at least another year will forestall renegotiation of labor contracts in the automobile industry, all of which link wages with the cost of living. Previously, BLS had planned to issue only one cost of living index instead of two (designated as the old and new indexes).

The new index is adjusted for consumer spending habits, and it is this index that the Bureau was considering adopting. However, since present labor contracts in the automobile industry are based on the old index, they would have to be renegotiated if the new one were to be adopted. It is understood that both indexes will be published for another year before being abandoned for adoption of a completely revised index.

RFC Awards Sizable Loan to Standard-Thomson

Reconstruction Finance Corp. recently granted a $2 million loan to Standard-Thomson Corp., manufacturers of metal parts used in aircraft, automobiles, and other forms of transportation. The loan was made specifically for the construction of new facilities and the purchase of machinery and equipment.

MERCEDES RETURNS

Mercedes cars are again coming off the assembly line at the Mercedes-Benz plant in Stuttgart, Germany. Famous the world over for their speed and beauty, these luxury automobiles are still high in price.

(Authenticated)

News of the AUTOMOTIVE

NPA Issues Several Orders of Industry Importance

Several actions of the National Production Authority recently merit attention. First, NPA announced the establishment of new procedures to insure that military and atomic energy production schedules and industrial expansion programs are supported by an adequate flow of essential component parts. In short, the new procedures provide for free use of directives where present Controlled Materials Plan machinery is deemed inadequate to assure delivery of vital components for the defense program.

Second, NPA ordered the nation's junkyards to dispose of an estimated four million cars produced before 1946. The inventory control order is intended to force approximately two million tons of iron and steel scrap from the yards of auto wreckers in the next four months.

Next, NPA revealed that requests for structural steel from various industries totaled 610,440 tons for the first quarter of 1952, but that actual allocations for that period amount to only 370,315 tons. In another action on the metals front, Secretary of Commerce Charles Sawyer issued a proclamation ordering that Government-held surplus stocks of aluminum, copper, lead, and zinc scrap be made available to industry instead of being transferred to the strategic stockpile.

PYLONS WITH A PURPOSE

Several Westinghouse production model pylons, used for carrying auxiliary fuel tanks or armament, are checked before suspension beneath each wing of Republic F-84 Thunderjets. Their contents or they themselves can be jettisoned, if necessary, by the electrical and air control system.

Buick Production Down 38 Per Cent

Buick Div. of General Motors Corp. expects to build 74,469 cars during the first quarter of 1952, a drop of about 38 per cent from the same period a year ago when 121,051 cars were built. Last year, according to Ivan L. Wiles, general manager, Buick built a total of 404,000 automobiles, nearly 150,000 fewer than the record year of 1950, but still the second highest production year for Buick on record.

When Buick's present expansion is completed, total floor space will increase to about 11 million sq ft, compared with 7.5 million at the present time. Additions to facilities at Flint, Mich., account for 3,307,500 sq ft, including a jet parts plant with 580,000 sq ft, a general manufacturing plant of 878,200 sq ft, and a subassembly plant for jet engines covering 1,667,500 sq ft. Another plant, a 182,000 sq ft addition to the foundry, has been completed and is being used for machining operations on tank transmissions. Buick is also building a new plant at Willow Springs, Ill., which will have more than one million sq ft of space for assembling and testing jet engines.

1951 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1951 Ten Months' Totals.

MAKE	October 1951	September 1951	October 1950	TEN MONTHS Units 1951	Units 1950	Per Cent of Total 1951	Per Cent of Total 1950
Chevrolet	29,220	28,342	36,873	304,319	355,751	35.18	36.72
Ford	23,554	21,954	29,154	215,637	267,864	24.94	27.64
Dodge	9,655	8,653	10,321	90,676	79,630	10.49	8.22
G. M. C.	8,908	8,912	8,235	86,619	80,323	10.02	8.29
International	11,247	8,906	6,804	81,497	68,001	9.43	9.08
Studebaker	3,470	3,057	3,263	27,504	38,858	3.19	4.11
Willys Truck	1,574	1,302	1,495	13,096	12,888	1.51	1.33
White	1,132	845	1,241	10,590	9,661	1.22	1.00
Mack	862	590	897	8,599	7,523	.99	.78
Willys Jeep	799	785	788	7,486	7,257	.87	.75
Diamond T	370	312	844	3,947	4,797	.46	.50
Divco	333	251	384	3,327	3,418	.38	.35
Reo	268	238	405	2,989	3,040	.35	.31
Brockway	175	129	246	1,933	1,845	.22	.19
Autocar	181	116	192	1,762	1,715	.21	.18
Federal	82	80	160	876	1,195	.10	.12
Pontiac	117	64	80	736	1,251	.09	.13
Kenworth	57	51	65	574	622	.07	.05
F. W. D.	68	27	30	418	255	.05	.03
Sterling	26	20	37	293	298	.03	.03
Peterbilt	20	20		258		.03	
Miscl. Domestic	116	166	172	1,292	1,849	.15	.16
Miscl. Foreign	21	24	26	215	313	.02	.03
Total—All Makes	92,281	84,814	101,169	864,737	968,954	100.00	100.00

* Based on data from R. L. Polk & Co.

Luscombe to Make B-36 Rudder

Luscombe Airplane Corp. revealed recently that it has received a letter of intent from Consolidated Vultee Aircraft Corp. for the manufacture of the rudder for the B-36 bomber. The company is already producing the elevator and a variety of door assemblies for this type of plane.

Navy Tests Helicopter With Gas Turbine Unit

The Navy recently announced the first successful flight of an experimental K-225 helicopter powered by a 175-hp, Boeing XT50 gas turbine engine. The 250-lb turbine may reportedly be operated on fuels such as kerosene or high-octane gasoline.

Higher Costs to Drive Car, Truck Prices Up

Even though there has been no rush by automobile manufacturers to raise their prices under the authorization of Office of Price Stabilization orders permitting them to do so under the Capehart Amendment, it is generally conceded in the industry that prices are heading upward. There is no doubt that the somewhat soft market has had considerable influence on the cautious approach of automobile manufacturers about increasing prices at this particular time. The present higher ceilings are, nonetheless, welcome because, if and when the market stiffens, and as wages and material costs increase, the manufacturers will be in a position to put higher prices into effect. All companies are studying their costs and undoubtedly will file applications for higher ceiling prices with OPS, even though they may have no intentions immediately of putting them into effect.

The provision permitting price increases to recover the added cost of conversion steel seems to be somewhat academic. Use of such steel has been declining steadily in the industry during the past few months, and, unless the situation changes radically, most companies will be out of the picture on conversion steel or down to only very small-scale use during the early part of 1952.

However, if a shortage of automobiles develops, as now is expected by many industry officials, and if steel prices go up as a result of wage increases in the steel industry, automobile builders will be in position to increase their prices. Ford Motor Co. already has filed an application to increase ceiling prices on tractors about 6.3 per cent and on industrial engines, service parts, and accessories, about three per cent. In addition, the company is studying its truck line and optional truck equipment to determine what increases can be made within the allowable limits of the new ceilings.

1951 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1951 Ten Months' Totals.

MAKE	October 1951	September 1951	October 1950	TEN MONTHS Units 1951	Units 1950	Per Cent of Total 1951	Per Cent of Total 1950
Chevrolet	77,377	79,883	129,778	933,188	1,208,829	21.11	22.67
Ford	61,494	62,099	113,210	750,372	1,011,061	16.97	18.97
Plymouth	35,961	46,387	67,961	485,823	432,614	10.99	8.12
Buick	29,106	30,623	41,060	340,664	446,803	7.71	8.38
Pontiac	24,525	27,998	36,156	282,095	372,420	6.61	6.99
Dodge	23,580	28,402	31,340	261,017	243,813	5.91	4.57
Oldsmobile	19,398	22,145	29,418	238,188	310,776	5.39	5.83
Mercury	16,994	17,963	25,583	201,540	268,451	4.56	5.04
Studebaker	16,902	20,076	16,065	178,224	239,078	4.03	4.49
Chrysler	9,962	11,662	16,997	132,389	119,882	3.00	2.25
Nash	13,557	14,031	14,606	119,531	152,324	2.71	2.86
De Soto	8,907	10,340	12,397	96,597	99,860	2.19	1.89
Hudson	7,111	6,660	4,606	85,358	118,500	1.93	2.22
Cad'lac	8,459	7,698	11,268	83,485	84,086	1.89	1.58
Packard	5,515	5,556	7,396	57,906	59,726	1.31	1.12
Kaiser	3,715	3,743	9,496	46,358	75,062	1.05	1.41
Henry J	3,491	3,638	5,330	45,867	5,330	1.04	.10
Willys	2,288	2,177	2,560	23,183	29,969	.52	.53
Lincoln	2,275	2,402	2,700	22,421	28,619	.51	.54
Crosley	396	421	573	4,746	6,004	.11	.11
Frazer			244		11,444		.21
British Austin	405	385	345	3,027	4,878	.07	.09
British Ford	435	382	214	2,962	1,467	.07	.03
Miscl. Domestic	219	324	339	2,665	1,527	.06	.03
Miscl. Foreign	1,488	1,363	1,101	11,347	7,304	.26	.14
Total—All Makes	373,162	406,217	560,373	4,418,720	5,329,986	100.00	100.00

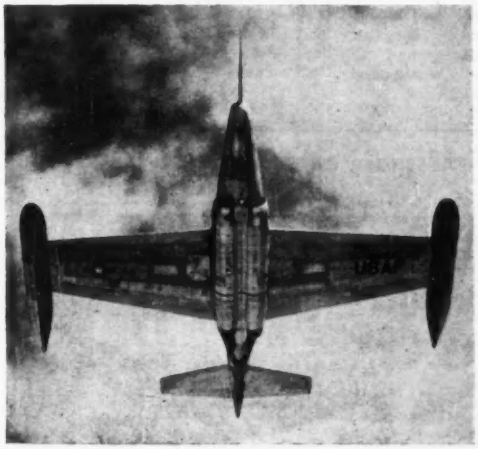
* Based on data from R. L. Polk & Co.

Nash Observes Golden Anniversary in 1952

Nash Motors Div. of Nash-Kelvinator Corp. has published a pictorial history of its cars in connection with its 50th anniversary to be held this year. Pictures of the car are arranged in chronological order, beginning with the two earliest Rambler cars built by Thomas B. Jeffery Co., predecessor of the current firm. Called the "Nash Family Album," the publication has more than 100 pictures of cars produced by Nash or Jeffery and has an excellent year-to-year history of mechanical developments and style trends.

GM Wins NPA Grace On Transmissions

According to recent reports, General Motors Corp. has been successful in its appeal to the National Production Authority to mitigate the order which drastically curtailed the number of automatic transmissions permissible on its cars. It is understood that the percentages of installations now will be: Oldsmobile, 96 per cent; Buick, 77 per cent; Pontiac, 72 per cent; and Chevrolet, 35 per cent.



ROCKETSHIP SCORPION

Rocketing skyward is the F-89D, latest version of the Northrop twin-jet Scorpion all-weather interceptor plane. This model has a gross weight, including a full complement of fuel and armament, in excess of 40 000 lb. The plane's firepower is derived from its powerful array of deadly rockets, which can be fired with unerring accuracy by special aiming and triggering equipment, even at the craft's 600-mph speeds.

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

1951 Recorded As Good Year for Automotive Industry

Although the impact of the defense program was being heavily felt at the end of last year, the automotive industry had a good year for 1951 as a whole, largely as a result of the momentum attained in the first half of the year. As a result, total production was second highest in history. Passenger cars suffered most from government restrictions, winding up the year about 20 per cent below the record of 1950, but trucks hit an all-time production total to bring the combined passenger car, truck, and bus production for the year to only 15 per cent below that of 1950.

Despite the difficulties the industry encountered during 1951, several new records were established. Registrations climbed to a new all-time high of 52,236,000 units, including 42,846,000 passenger cars and 9,390,000 trucks and buses. The net gain in registrations over 1950 is estimated at more than three million units.

Even though production of vehicles was down from the previous year, special taxes last year hit a new high, accounting for $4.57 billion, compared with a previous record of $4.354 billion in 1950. Last year trucks alone accounted for $1.3 billion of the total of special taxes on motor vehicles.

Scrapping of old vehicles also hit a new record in 1951 estimated at more than three million units. The large scrappage rate was an important factor contributing to the reduction in the average age of passenger cars from 7.8 years in 1950 to an estimated 7.3 years at the end of last year. At the same time, age of trucks went from 7.0 to 6.7 years. However, there still are 18 million cars over 10 years of age in use in this country, and it is expected that the scrappage rate will continue to increase.

Of considerable interest are the new records established last year for vehicle miles of travel and gasoline consumption. Estimates put motor vehicle travel at 485 billion miles and consumption of gasoline at 37.5 billion gallons. Due to the increasing congestion brought about by the new record number of vehicles in use, there has been increasing concern about the nation's inadequate highway system. A new informal organization, to be known as PAR (project adequate roads) is under development to bring together all interested industries and organizations for unified efforts to meet the critical highway problem.

The year 1951 was a busy one for automotive companies with defense contracts. There was very little actual production of war goods, but the tooling-up projects made considerable headway during the year, although it will still be many months before some of them get into production. Building of new plants and installing the necessary tools and equipment is a monumental job, involving production planning and other preparations not only by prime contractors, but for suppliers in all parts of the country, including thousands of small businesses working as subcontractors and suppliers. For example, the jet engine to be built by Chrysler requires more than 7300 parts and, even though all major components will be machined by Chrysler, accessories, standard parts, and all castings and forgings will be supplied by about 350 different suppliers.

1952 Trucking Outlook Seems Generally Good

All in all, the outlook for the trucking industry during 1952 is relatively favorable with the expectation that highway carriers will be transporting more military cargoes and fewer civilian. There seems little doubt, however, that it will become increasingly difficult to get new rolling equipment or repair and replacement parts. Tires are expected to be in good supply although more synthetic in large sizes will have to be used.

The Defense Production Administration has set its sights on a production of at least one million trucks during 1952. The National Production Authority had allocated enough steel for the first quarter of 1952 to permit an estimated output of 240,000 units, but a steel plate shortage arose to quash hope of fulfilling this goal. However, it is reported that NPA expects to be able to make sufficient allotments during the last half of the year to meet the 250,000 per quarter quota.

Lockheed Business Up With Huge Backlog

According to a recent announcement, unfilled orders on the books of Lockheed Aircraft Corp. currently total approximately $1,280,000,000, including contracts nearing the signature stage. Military business constitutes 89.6, and commercial orders 10.4 per cent of the backlog. It is estimated that sales for 1951 will total approximately $235 million, or 35 per cent higher than the 1950 volume.

(*Turn to page* 102, *please*)

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	October 1951	September 1951	October 1950	Ten Months 1951	Ten Months 1950	Per Cent Change: October over September	Per Cent Change: October over October 1950	Per Cent Change: 10 Months 1951 over 1950
1	New England	20,972	21,440	32,939	252,797	299,448	— 2.18	—36.33	—15.58
2	Middle Atlantic	68,918	76,978	107,118	845,897	998,559	—13.07	—37.53	—15.12
3	South Atlantic	45,943	48,790	65,312	522,685	622,187	— 5.84	—29.66	—15.99
4	East North Central	97,672	101,576	147,615	1,140,359	1,318,187	— 3.84	—33.83	—13.49
5	East South Central	18,079	19,072	27,576	205,454	266,513	— 5.21	—34.44	—22.91
6	West North Central	41,025	44,540	74,456	460,408	571,443	— 7.89	—44.90	—19.43
7	West South Central	33,159	38,109	45,606	366,030	467,666	— 8.32	—27.29	—22.06
8	Mountain	11,857	14,247	18,870	148,287	186,858	—16.78	—37.16	—20.64
9	Pacific	37,537	43,405	60,883	454,803	570,923	—13.82	—38.35	—20.34
	Total—United States	373,162	408,217	580,373	4,418,720	5,329,966	— 8.14	—35.70	—17.10

States comprising the various regions are:—Zone 1; Conn., Me., Mass., N. H., R. I., Vt.—Zone 2; N. J., N. Y., Pa.—Zone 3; Del., D. of C., Fla.; Ga; Md., N. C., S. C., Va., W. Va.—Zone 4; Ill., Ind., Mich., Ohio, Wisc.—Zone 5; Ala. Ky., Miss., Tenn.—Zone 6; Iowa, Kan., Minn., Mo., N. D., S.D.—Zone 7; Ark., La., Okla., Tex.—Zone 8; Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.—Zone 9; Cal., Ore., Wash.

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers

Leece-Neville Co.—**P. H. Neville** has been elected president.

United Aircraft Corp., Pratt & Whitney Aircraft Div.—**P. D. Doran** has been promoted to chief of commercial sales.

United Aircraft Corp., Hamilton Standard Div.—**Thomas B. Rhines** has been made assistant chief engineer; **William E. Diefenderfer**, chief development engineer; **Alden P. Edson**, chief materials engineer; **Donald G. Richards**, chief, vibration and mechanical metallurgy; **Stanley G. Best**, consulting project engineer; **Walter Arnold**, systems engineer; **Arthur N. Allen**, design project engineer; **Thomas P. Farkas**, project engineer, in charge of electronic control development; and **Edward W. Radtke**, design engineer.

Automotive Rubber Co., Inc.—**Phillip Millard** has joined the sales engineering staff.

General Motors Corp., Chevrolet Div.—**Ross Fraser** has been appointed assistant advertising manager.

Ford Motor Co.—**Leggett Brown** has been named assistant to the director of public relations. **Kenneth Gregory** succeeds him as manager of the News Bureau.

Norton Behr-Manning Overseas, Inc.—**Herbert A. Stanton**, has been selected to head a newly formed Mexican sales-distributing company. **Edgar A. Maschal** is vice-president.

Rolls-Royce Montreal, Ltd.—**Dr. E. Warlow-Davies** has been named general manager and chief engineer. **David Boyd** has been appointed production manager.

Kaiser-Frazer Corp.—**E. R. Ordway** has been chosen manager of West Coast aircraft production.

Westinghouse Electric Corp.—**H. H. Hanft** has been named assistant to the manager of the Industrial Dept.

Automotive Rubber Co., Inc., ARCO Rubber Processors Div.—**R. P. Ganchan** has been chosen to head activities at the new Houston, Tex., plant.

General Electric Co.—**Edward A. Green** has been selected as manager of product planning for the Small and Medium Motor Dept.

United States Rubber Co.—Carlton H. Gilbert has been appointed advertising manager.

Massey-Harris Co. — C. P. Milne has been chosen executive vice president.

Luscombe Airplane Corp.—L. H. Bender has been named superintendent of manufacturing control and contract administration.

Aro Equipment Corp.—**R. B. Blythe** has been appointed executive chief engineer of the Bryan, O., factory. **J. R. Markey** succeeds him as sales manager of the Aircraft Div.

Briggs Manufacturing Co., Refinishing Materials and Parts Div.—**James L. Ryan** has been named West Coast regional manager.

Bell Aircraft Corp., Helicopter Div.—**Laurence P. Saunders** has been appointed chief administrative engineer.

Ethyl Corp.—**Malcolm P. Murdock** has been promoted to general sales manager.

Consolidated Vultee Aircraft Corp., Guided Missile Div.—**Routt A. Bryant, Jr.**, has been appointed manager of plant engineering.

Dana Corp.—**William J. Joyce, Jr.**, has been named liaison engineer.

Norton Co., Grinding Machine Div.—**Frank W. Smith** has retired as vice-president but remains as a consultant.

MacDermid Western, Inc.—**Dr. A. Lloyd Taylor** has been appointed director of research.

Arrowhead Rubber Co.—**Arthur W. McGuire** has been named assistant sales manager.

Air Reduction Co., Inc.—**Joseph H. Humberstone** has been elected a vice-president.

Samuel Moore & Co.—**M. Robert Thomas** has been chosen personnel director and asistant advertising manager.

(*Turn to page* 108, *please*)

Necrology

Russell A. Firestone, 50, a director of Firestone Tire and Rubber Co., died Dec. 12, in New York, N. Y.

George W. Davies, 62, general sales manager, Sealed Power Corp., died Dec. 3, in Muskegon, Mich.

James F. Fennnig, 47, manager of the Raybestos Div. plant of Raybestos-Manhattan Co., Inc., died Dec. 17, in Fairfield, Conn.

Matthew Green, 58, manager of Parker Rust Proof Co., died Dec. 12, in Morenci, Mich.

Henry F. Michell, 61, traffic manager of the Autocar Co., died Dec. 15, in Swarthmore, Pa.

James Craig, 86, former marine engine manufacturer and manager of the New York Motor Boat Show, died Dec. 9, in Providence, R. I.

Kirke K. Hoagg, 62, U. S. and Canadian vehicles engineer for General Motors Corp., died Dec. 11, in Scarsdale, N. Y.

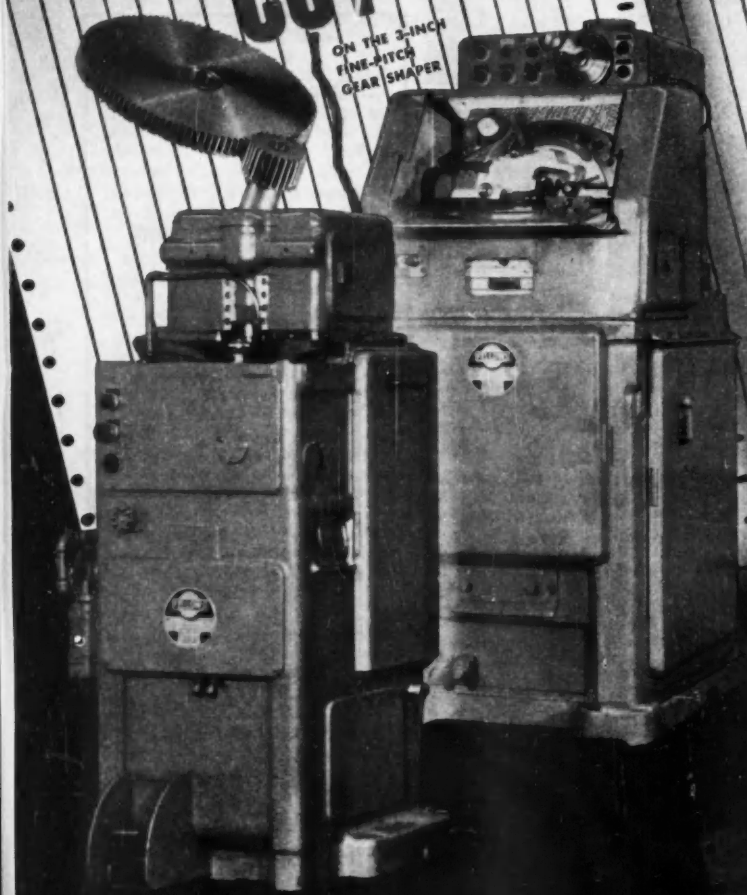
Frank H. Taylor, 75, instrumental in the early development of the Curtiss airplane, died recently, in Cleveland, O.

William L. Mantha, 66, automotive inventor, died Dec. 14, in Bayport, L. I., N. Y.

ACCURATE

FELLOWS
CUT
ON THE 3-INCH FINE-PITCH GEAR SHAPER

FELLOWS
SHAVED
ON THE NO. 4 FINE-PITCH GEAR SHAVING MACHINE



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

GEAR OPERATIONS

...in Balance

Ability to Mass-Produce Fine-Pitch Gears to Tolerances in Low "Tenths" Spotlights The Fellows Method.

The balanced combination of the Fellows "Fine-Pitch" Gear Shaper and the No. 4 Gear Shaving Machine, aided by the superlative accuracy of Fellows cutters and shaving tools, assures unbelievably close limits. The inspection charts opposite are reproduced from production-run performance—where specifications demanded holding these 48-pitch gears to 0.0003" after shaving. ▾▾▾ The routine super-precision is accomplished by setting up for 3 cuts on the Gear Shaper, and 6 passes on the companion Fellows Shaving Machine. Notice, please, that with accurately-machined blanks it was possible to hold a maximum error after cutting to 0.0005"—and not over 0.0002" after shaving. ▾▾▾ If you have fine-pitch gears to produce, Fellows can help you hold to any tolerances that contemplated service demands. Write, wire or phone the nearest Fellows office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 323 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1

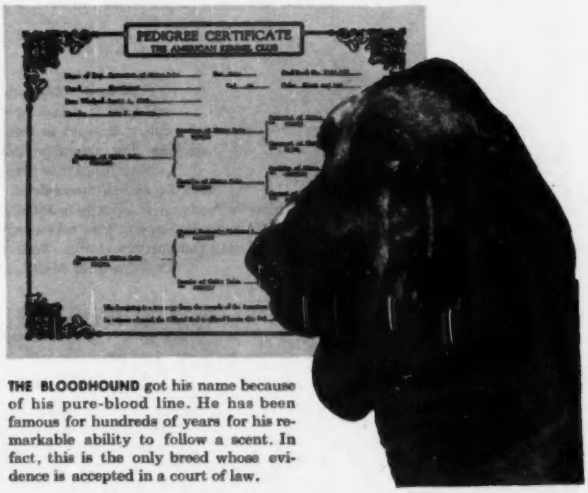
Greater
Productivity
AUTOMATIC BAR AND CHUCKING MACHINES · PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING DRILLING AND MILLING MACHINES
NEW BRITAIN
Automatics
THE NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

What's a Pedigree Mean? It Means You Can Be Sure!

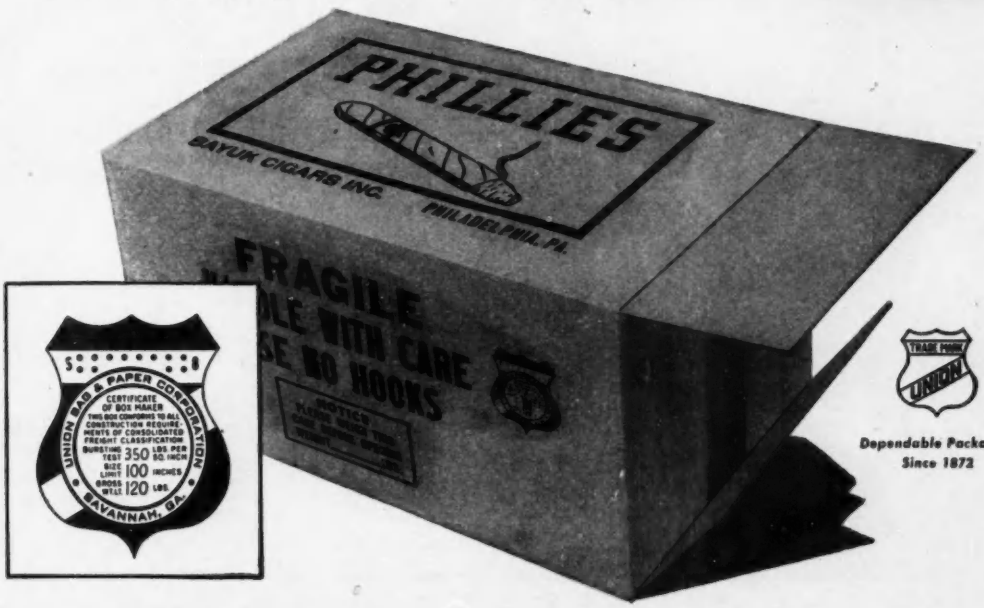
...and when you buy Union's *pedigreed* corrugated containers, you can be sure the quality is the same from carload to carload ... you can be sure your losses from breakage and returns will be at a minimum.

Union corrugated boxes have a pedigree going back in an unbroken line to the forests owned or cultivated by Union ... to Union's huge mills and fabricating plants. Every step is controlled by Union.

That is why Bayuk Cigars Inc. pack their famous Phillies, the favorite smoke of millions, in Union boxes — the boxes with a pedigree.



THE BLOODHOUND got his name because of his pure-blood line. He has been famous for hundreds of years for his remarkable ability to follow a scent. In fact, this is the only breed whose evidence is accepted in a court of law.



Dependable Packaging Since 1872

UNION Corrugated Containers

UNION BAG & Paper Corporation

Principal Offices: WOOLWORTH BLDG., NEW YORK 7, N. Y.

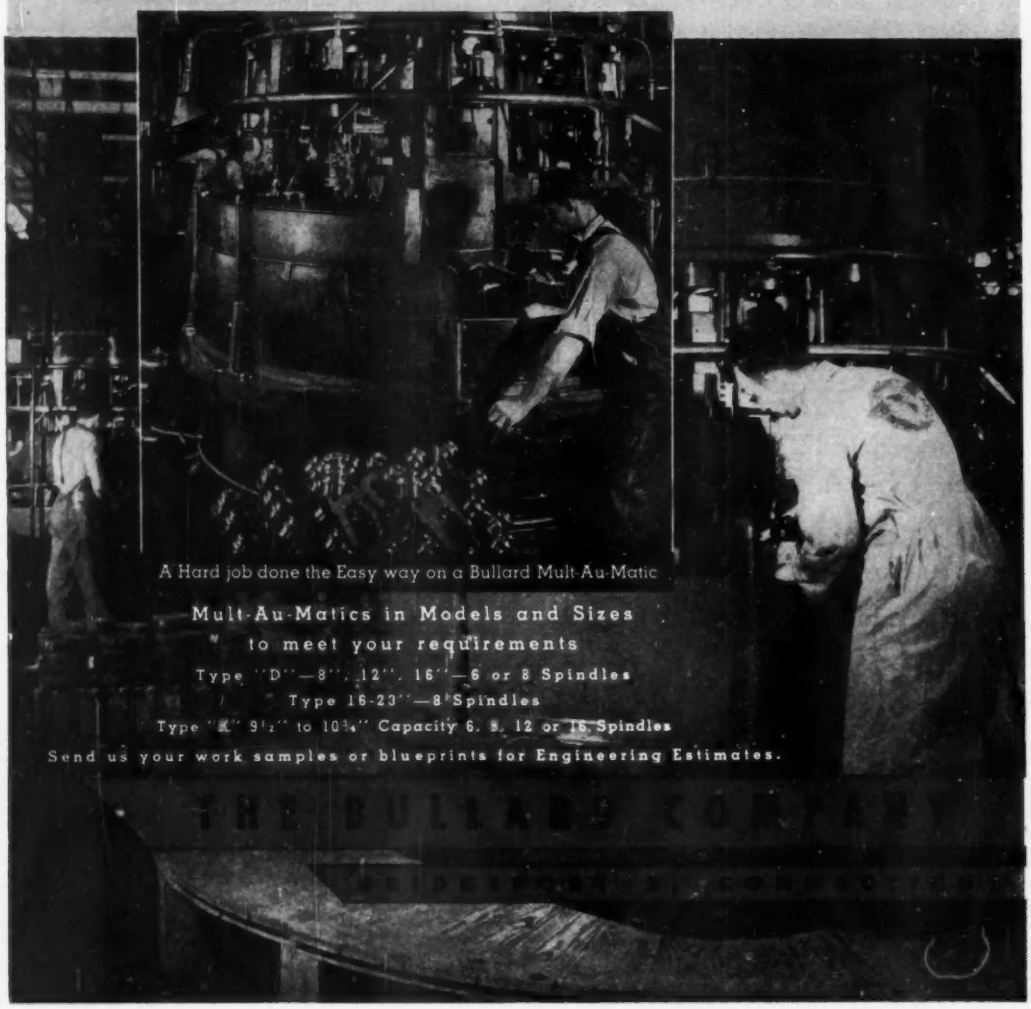
Corrugated Container Plants: **SAVANNAH, GEORGIA • CHICAGO, ILLINOIS • TRENTON, NEW JERSEY**

Profitable Productive Ability with MEN and MACHINES...

A well known axiom "The whole is greater than any of its parts" leads us to consider—Men and Machines. Mult-Au-Matics are designed and built with a thought to the human operating element. Operators on every hand acclaim this viewpoint and produce accordingly. Therefore, with men and Mult-Au-Matics, Production Volume is only limited by the Ability of the Mult-Au Matics themselves.

This Ability or Productive Capacity is definitely stated in Bullard Engineering Estimates on your work. We suggest that you take advantage of our Engineering Service with a view to making comparative studies. Reflect on your comparisons, and at the same time Reflect on—Men and Mult-Au-Matics—The Profitable Combination.

BULLARD



A Hard job done the Easy way on a Bullard Mult-Au-Matic

Mult-Au-Matics in Models and Sizes to meet your requirements

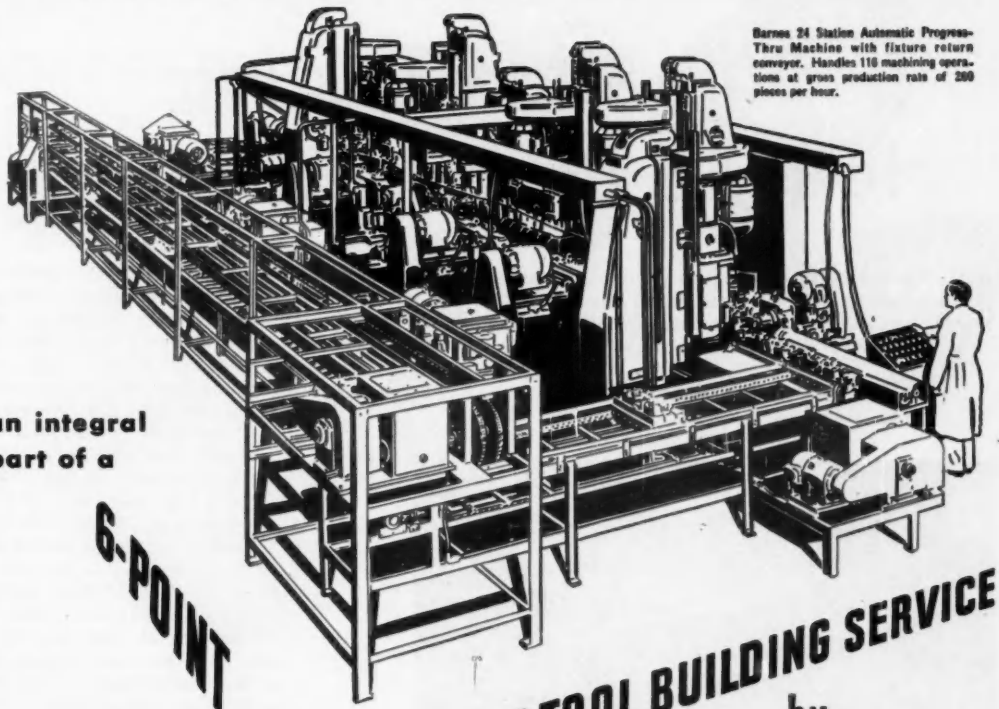
Type "D"—8", 12", 16"—6 or 8 Spindles

Type 16-23"—8 Spindles

Type "K" 9½" to 10¾" Capacity 6, 8, 12 or 16 Spindles

Send us your work samples or blueprints for Engineering Estimates.

SPECIAL HANDLING and CONVEYOR EQUIPMENT



Barnes 24 Station Automatic Progress-Thru Machine with fixture return conveyor. Handles 116 machining operations at gross production rate of 200 pieces per hour.

an integral part of a 6-POINT MACHINE TOOL BUILDING SERVICE by W. F. and JOHN BARNES

Barnes Special Machine Tool Building Service Includes . . .

1. SPECIALIZED MANUFACTURING FACILITIES — 75 year background, large well equipped plant efficiently tooled to produce high production machines.
2. SPECIAL HYDRAULIC EQUIPMENT — designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
3. SPECIAL GAUGES, FIXTURES, TOOLS — designed for each individual machining problem, assure accuracy of operations at high production speeds.
4. SPECIAL ELECTRICAL EQUIPMENT and CONTROLS — individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions.
5. SPECIAL HANDLING AND CONVEYOR EQUIPMENT — as illustrated above.
6. COORDINATED DESIGN AND ENGINEERING — Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work, solves complex problems quickly.

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MULTIPLE SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

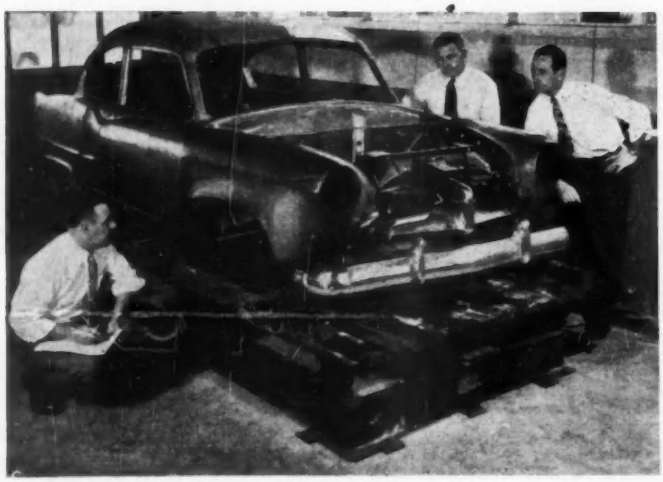
Vibration Testing Henry J Body and Frame

ILLUSTRATED here are two setups for a series of tests conducted recently by engineers of the Kaiser-Frazer Corp. and Tinnerman Products, Inc. As shown in the illustration, the frame and body of a Henry J car were assembled to an L.A.B. vibration machine with the frame first secured by a forward rear-spring shackle mount and U-bolts over the frame near the front hold-downs. This was done in a way to prevent relative motion between the test machine table and the body-and-frame assembly. The vibration platform motor was then run at a speed corresponding to 235 cycles per minute for the table. After an extensive run, all of the Tinnerman Speed Nuts on the body were checked and found to torque the same as the start. There were 100 of these Speed Nuts on the body and frame of the test car; 18 on the rear fenders, 12 on the front fenders, 12 on the body hold-downs, and 58 on the front end assembly. Following this test, operation of the machine was increased to 285 cycles per minute, and during this run the Speed Nuts were found intact.

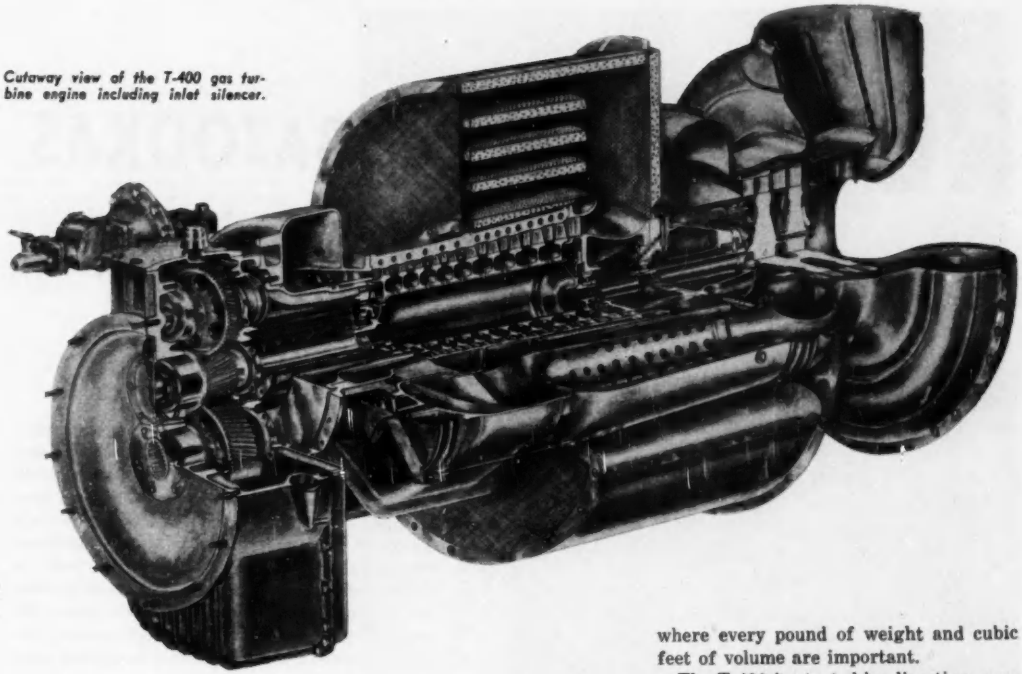
Frame and body of Henry J on L.A.B. vibration machine.

To increase the severity of vibratory stresses and to simulate actual driving conditions, the position of the body on the vibration machine was changed as shown in the photo. The rear frame cross member was supported at a point some distance from the machine while the front of the body was held to the table only by its own weight, but was prevented from creeping by a cross bar on the table. The front frame cross-member was bolted to a board to prevent damage to the table, and the board was greased to minimize sliding friction.

(*Turn to page 86, please*)



This illustration shows the body resting on the vibration table while the rear frame cross member is fastened to a separate support.



Cutaway view of the T-400 gas turbine engine including inlet silencer.

Design Features of Small Gas Turbine for Driving Ship Generator

THE first gas turbine engine to be installed in an American Naval ship has been completed by Solar Aircraft Co., San Diego, Calif. The T-400 turbine will be used to drive a 250-kw electric generator, to provide emergency power on shipboard.

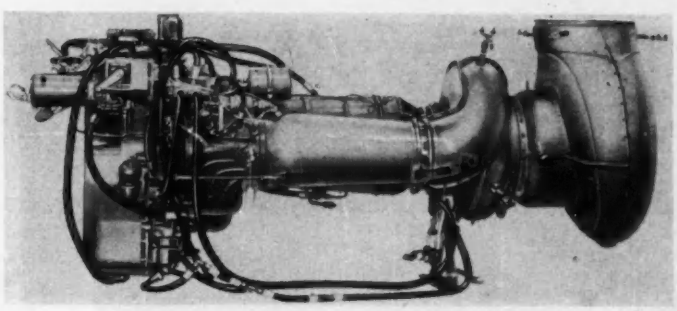
Weight of the basic engine, controls, and reduction gear box together is 561 lb. The unit is five ft long, and both height and width are less than three ft. It will be installed on a fast Navy ship where every pound of weight and cubic feet of volume are important.

The T-400 is started by directing compressed air against the blades of the turbine. This method of starting the engine was adopted for its simplicity, and because compressed air is readily available on shipboard.

In addition to its Navy use, the new T-400 has many potential civilian and military applications, according to the manufacturer. It may be adapted as a power source for uses ranging from helicopters to propulsion of small boats and military land vehicles. Industrial uses also are seen, such as powering pumps and compressors on pipe lines and in other applications.

Arrangement of the various components is illustrated in the cutaway and exterior views of the assembled unit. Shafts of the principal components—

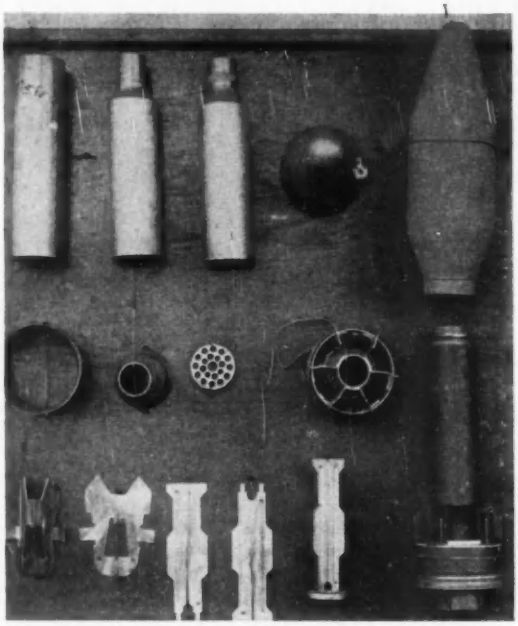
(*Turn to page* 98, *please*)



Arrangement of components is shown in this view of the T-400 gas turbine engine without inlet silencer.

ROCKETS *for* BAZOOKAS

By Joseph Geschelin



Here are the component parts and sub-assemblies of the Ford rocket. Several stages in the making of the motor body are shown in the left hand upper corner of the illustration.

AMONG the many military projects undertaken by Ford Motor Co. is the volume manufacture of 3.5 in. rockets used in the latest type bazooka weapon which has seen so much service in Korea. The rocket is composed of a number of parts, and demands meticulous care in manufacture as well as quality control to assure absolute soundness of major components. The illustration shows the group of parts that go into a single rocket, the major elements being the motor body and head assembly.

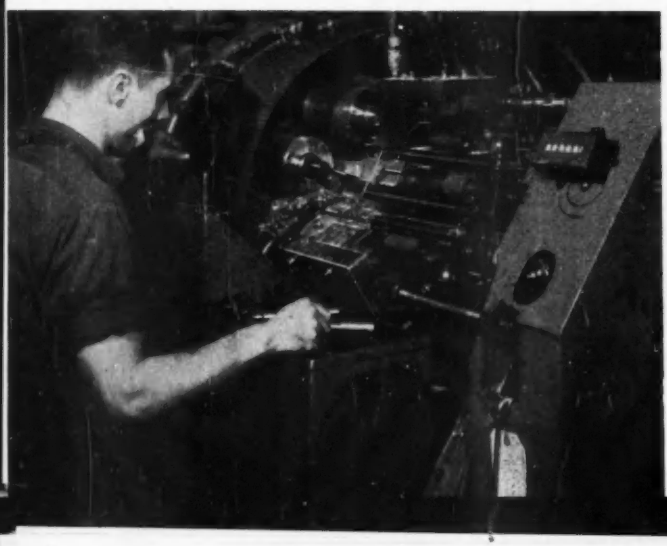
The motor body, one of the most critical parts from the standpoint of manufacture, is made from specification steel tubing—2.079-2.089 in. OD and wall thickness of 0.247 in. Because of close specifications and the need for salt bath heat treatment, tubing is handled carefully in heats and processed in batches of an individual heat.

To provide a condensed picture of major operations on the motor body, consider the following outline:

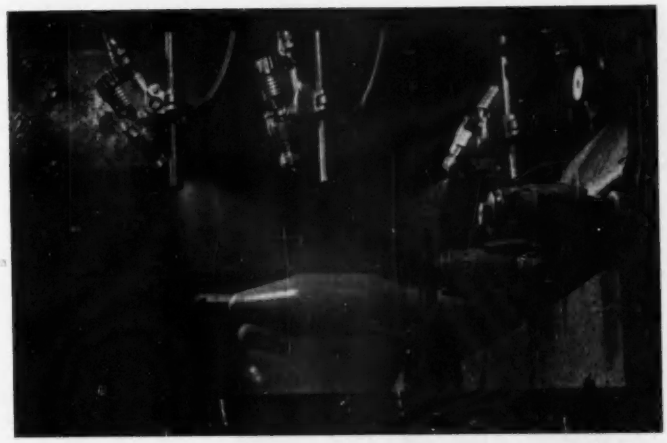
Tubing is cut to length in lathes; the ID is broached in a battery of American vertical broaching machines; and the OD is turned in a battery of Sundstrand automatic lathes.

The turned pieces then go to a 300-ton Cleveland press for the forming of the neck on one end. This is done in six stages, the work being indexed around from one station to another on a rotary indexing table.

Next the OD is ground in Cincinnati centerless grinders and the pieces are bored, counterbored, chamfered, and faced in a battery of large Conomatics.



Rough-boring of the motor body cavity is done in a battery of Baird automatics, one of these being shown in close-up in this view.



Spray painting of component parts is handled in a battery of DeVilbiss spray booths. Typical of such operations is this view of painting the entire head assembly. As shown, the work proceeds on a conveyor, mounted on rotating spindles. Spraying is done automatically by means of two spray guns as shown.

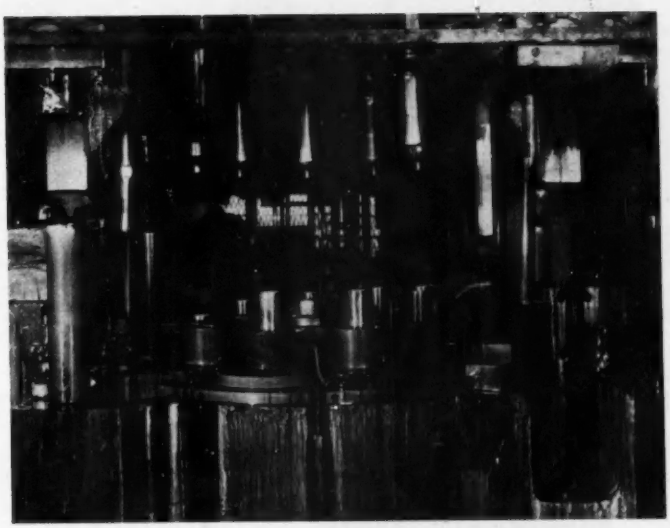
The work is now ready for heat treatment in the Ajax-Hultgren salt bath furnace, having an automatic conveyor feed cycle, and precise temperature control. An interesting feature of the unit is that work is loaded and unloaded at the same end.

Following degreasing the parts are ground on the OD in Cincinnati centerless grinders, and bored to size in Heald Bore-Matics. Additional roughboring of the cavity is done in a battery of Baird automatics, one of which is shown here.

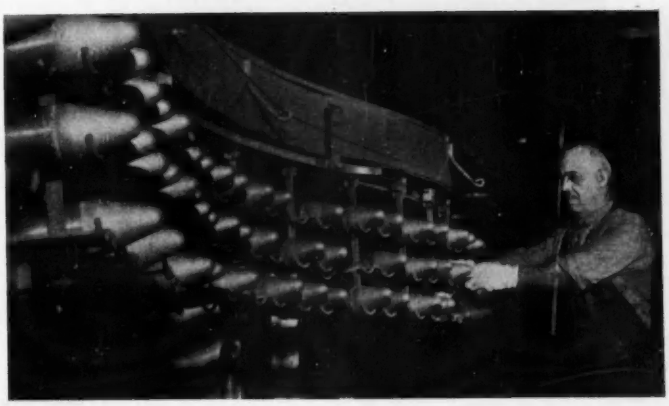
At this point the motor body is ready for hydrostatic pressure testing. This is done in two separate settings in Denison presses, applying 25,000 psi at each one.

The motor closure, a screw type fitting which closes off the motor body, also requires hydrostatic pressure testing. Being a smaller part and handled with more facility, it is tested in a multiple-station setup in an automatic cycle in a Denison Multipress. Noteworthy features of this machine are horizontal heads on

(*Turn to page* 86, *please*)

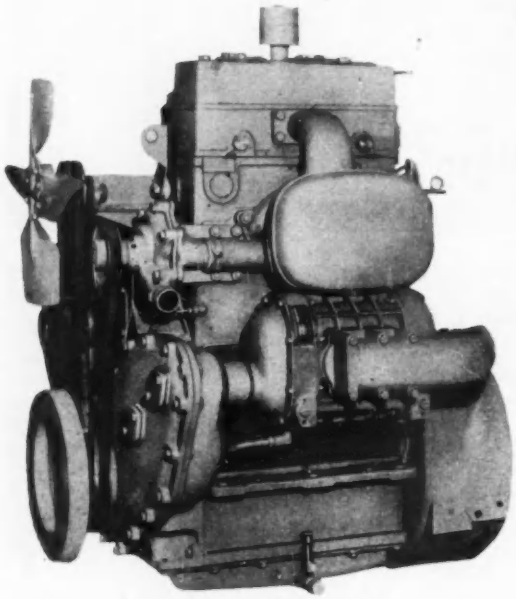


This view is a close-up of the die station of the 300-ton Cleveland press used for forming the motor body neck. This is done in six stages in the indexing table seen here.



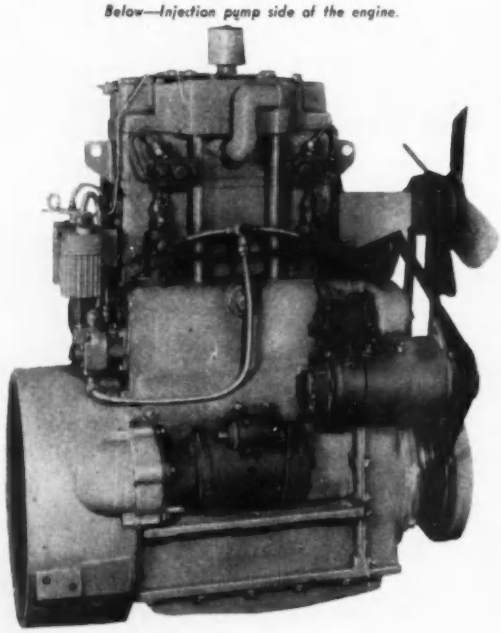
The entire operation has been mechanized by advanced materials handling methods. Here may be seen a portion of the one of the conveyor lines in the paint shop, indicating the manner in which the bomb-shaped head assembly is transported.

Two Stroke Diesel of



Above—Blower side of the Lever-Diesel.

Below—Injection pump side of the engine.

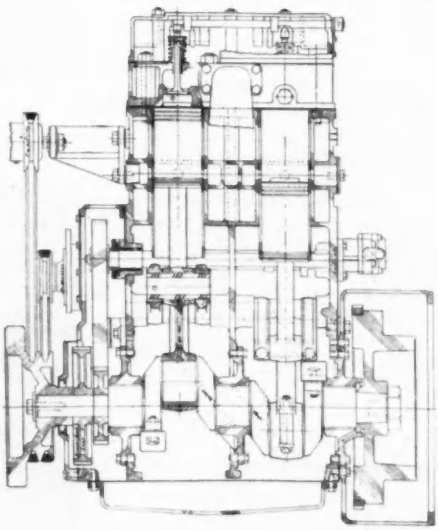


ANNOUNCEMENT has recently been made by Lever Motors Corp., Charleston, Ill., of a new Diesel engine of unconventional design. By taking advantage of an abandoned art in engine construction—the leverage system—an extremely long dwell at the bottom of the piston stroke is attained.

A reversal of common practice is made possible by use of the leverage system. Because of the pronounced dwell of the piston at the bottom of the stroke, the cylinder ports have been made the exhaust outlet, while the valve in the head is used for the inlet or scavenging air. Being an inlet valve, the life of this valve is greatly extended. At the same time, the incoming air is most effective in cooling the vital parts.

The maximum angularity of the piston rod is 3.3 deg off the axis of the cylinder bore. This slight angularity permits the side thrust of the piston to be held against the inside wall of the cylinder at all points in the reciprocation. This

Longitudinal sectional view of the new engine.



Unique Design

minimum of pressure against the cylinder wall is said to be sufficient to eliminate any tendency to piston slap. It also reduces piston and ring wear.

Immediately after the piston passes the top center, the upper pin in the connecting rod starts downward in an outward arc. This outward movement in conjunction with the outward movement of the crank pin not only makes for a more efficient application of power to the crank but also a more even distribution of pressure on the crank pin.

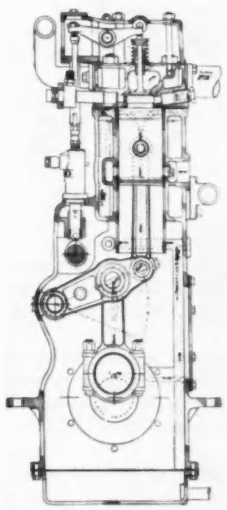
The piston stroke is 4.968 in. and the crank radius is 1.656 in. By use of these proportions the Lever-Diesel is able to secure an equalization of bearing pressures as well as a complete freedom in the rotative and reciprocating movements.

Since the power stroke in the Lever-Diesel is extended approximately 30 per cent beyond conventional practice, with moderate peak pressures and operation within the medium speed range, the Lever-Diesel can operate continuously on a higher mep without harmful effects, according to the manufacturer.

Condensed Specifications of Model D2 Lever-Diesel Engine

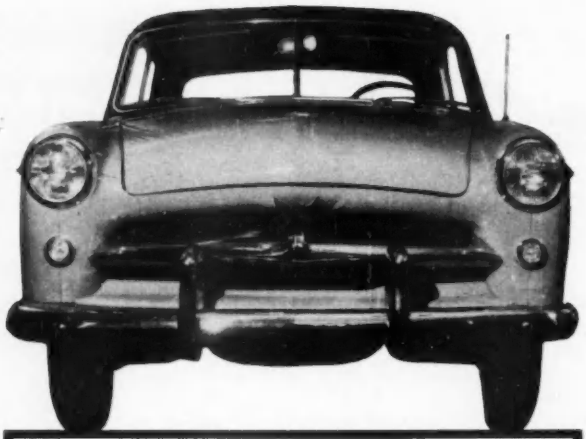
Bore (in.)	3.25
Stroke	5
Piston displacement (cu. in.)	82.4
Number of cylinders	2
Continuous hp at 1200 rpm	21
Maximum hp (intermittent)	24
Bmep (continuous)	84
Bmep (intermittent)	95
Compression ratio	16 to 1
Blower pressure (lb)	3 to 5
Weight, block and block components of cast iron (lb)	765

Since the engine illustrated here is a test unit and the first Lever-Diesel design, no claim is made that it represents the best in compact construction. Final production arrangements have not yet been made by Lever Motors Corp.



Left—Details of the reciprocating assembly and the overhead valve mechanism are shown in this transverse sectional drawing.

View of the reciprocating assembly. In a complete revolution of the crank, both the piston rod pin and the connecting rod pin oscillate approximately 68 deg each. Except for the fulcrum, the pins are under full pressure lubrication. They can be removed and reinstalled through the side of the engine block.



(Above)—
Overall height of the new Willys-Overland sedan is 60 in. (loaded), and body width is 72 in. at the widest section.

Condensed Mechanical Specifications
Willys-Overland F-head Engine

Model	685
Number cylinders	6
Valve arrangement	F-head
Bore (in.)	3⅛
Stroke (in.)	3½
Displacement (cu. in.)	161
Compression ratio	7.6 to 1
Brake hp. (max.)	90 @ 4400 rpm
Torque (max.) (lb ft)	135 @ 2000 rpm
Number main bearings	4

An Article by Joseph Geschelin

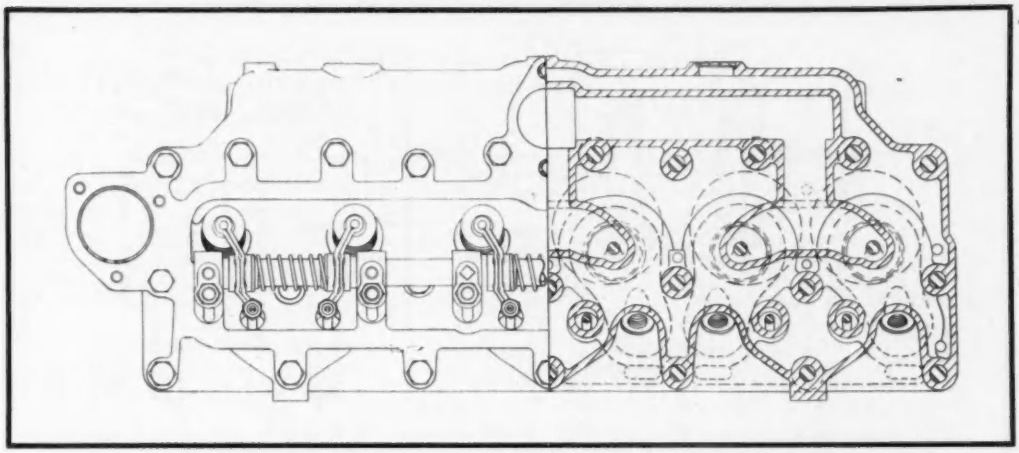
Mechanical Features of New W-O Passenger Cars

FOR the first time in practically ten years a historic name returns to the passenger car field. That is the dramatic news from Willys-Overland in announcing a line of passenger cars for the 1952 season. It will be recalled that the Americar was the last prewar car produced by Willys—a small, low-priced model intended for the mass market. By contrast the 1952 models are in a completely different class.

The sales program contemplates a rounded line of three series of cars—Deluxe, Super Deluxe, and Custom in a variety of body styles. At the outset, however, only the Super Deluxe and Custom models will be available and these only in the two-door body style. Next should be the introduction of a four-door sedan in the Custom line; and later in 1952 the Hard Top Line and the Deluxe Line.

While the styling treatment can be appreciated by examination of the photographs reproduced here, what is not so obvious to the eye is that W-O has cast its lot with the "unitized" frame construction, i.e., with body and frame integral.

Briefly, the car has a wheelbase of 108 in. Overall length—bumper to bumper—is 180⅞ in.; body width at widest section 72 in.; and overall height (loaded) 60 in. Aiming for maximum seating space



The intake manifold is cast in the cylinder head as shown in this part-sectional illustration.

and comfort for six adult passengers, hip room both front and rear is 61 in., while width at shoulder height is 57¼ in. Dry weight of the Super Deluxe is approximately 2517 lb while curb weight is around 2664 lb.

This announcement also incorporates the introduction of the long awaited F-head conversion of the six-cylinder engine—standard on all domestic Super DeLuxe and Custom passenger car models—having a rating of 90 bhp at 4400 rpm. The four-cylinder F-head engine, announced some months ago will be made available for export only. The DeLuxe series to be introduced later will continue the present L-head engine. Overdrive is optional on all models and will be installed on all cars produced at the time of introduction.

From the standpoint of fuel economy, road tests of cars with overdrive and high performance axle ratio of 4.56 to 1, produced the following results:

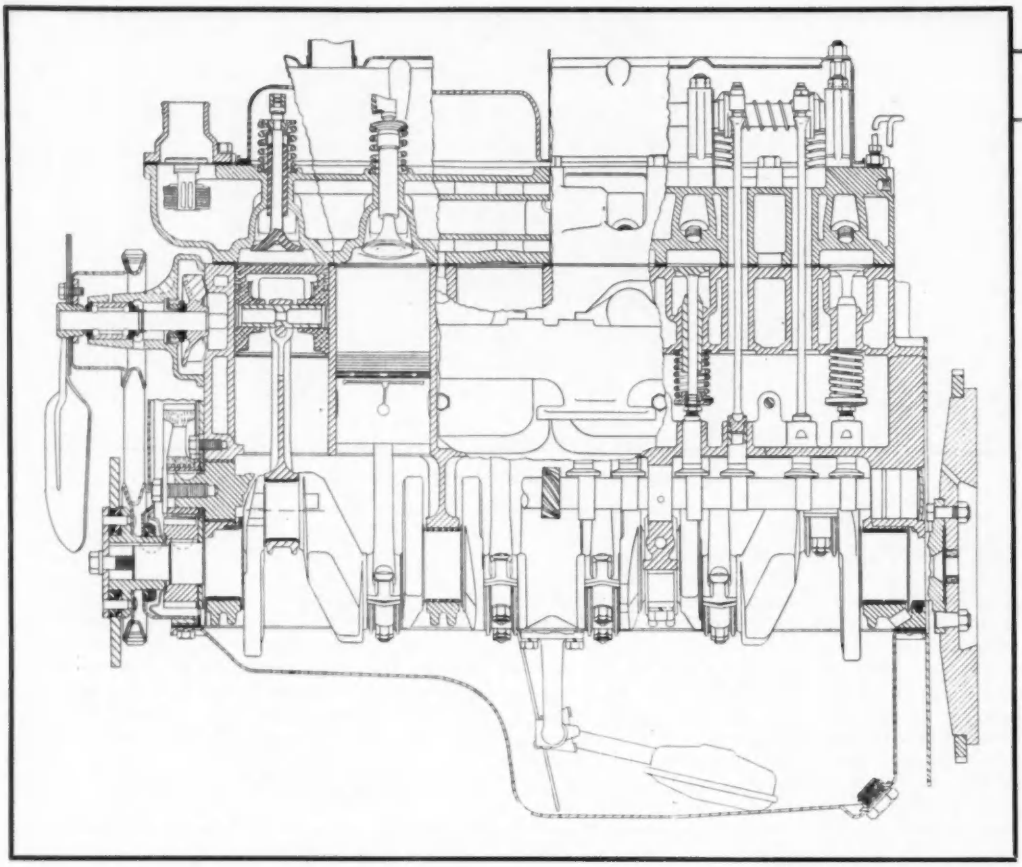
30 mph	35.0 mpg
50 mph	28.0 mpg
80 mph	17.0 mpg

According to engineering department tests, the following performance data have been recorded—a standing start to 60 mph through all gears can be made in 17½ seconds. Maximum speed is 90 mph with overdrive; 85 mph with direct drive. Engine revolutions per mile—2520 with overdrive; 3602 with direct drive.

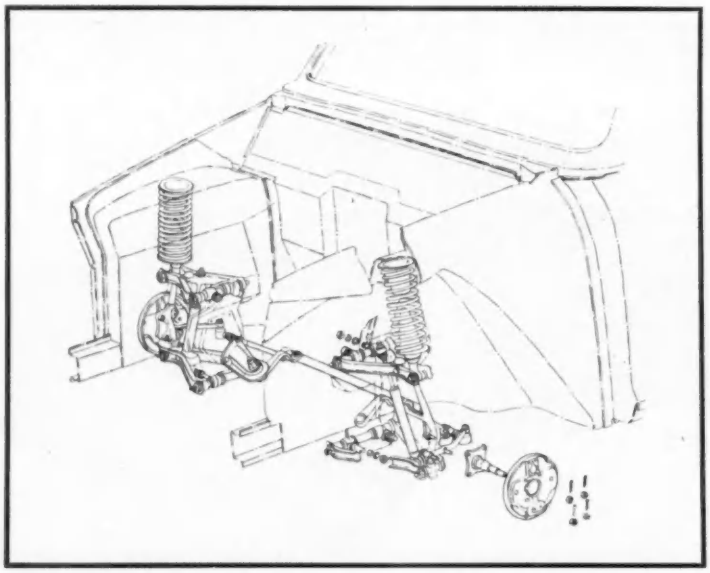
Exceptional characteristics are claimed for the F-head engine. The criterion of bhp/cu in. displacement is 0.560. The figure for lb-ft torque/cu in. displacement is 0.840. And finally, the weight/hp ratio (dry) is given at 28.4 lb.

Coming to mechanical design, consider first the new engine. For convenience the basic specifications data are given in tabular form, while the general features of the F-head construction are shown in the cross-sectional drawings. Compression ratio is high and

Super Deluxe and Custom models will be available in the two-door body style



Longitudinal sectional view of the F-head six-cylinder engine which will be standard on all domestic Super Deluxe and Custom passenger car models.



Partly-exploded view of the independent front suspension. Note that the coil spring is mounted on a rubber seat fitted in a recess in the wheel housing while its lower end is mounted on top of the king pin support.

yet the engine operates with regular fuels. As in the case of the four-cylinder engine conversion, the Six has the intake valve located in the head directly over the piston, while the exhaust valve is in the block to one side of the combustion chamber. Intake valve head diameter is 1¾ in., its large size making for free breathing.

The intake manifold, cast integrally with the head, has full length water jacketing which is said to maintain the most efficient control of fuel mixture temperature. Exhaust valve areas are fully water jacketed and exhaust valves are fitted with the T-P positive valve rotators now so widely used in heavy duty engines. Valve springs are of self-damping type.

Three-ring aluminum pistons with the top ring chromium-plated are standard and are provided with a heat dam. Spring backed oil control rings are used.

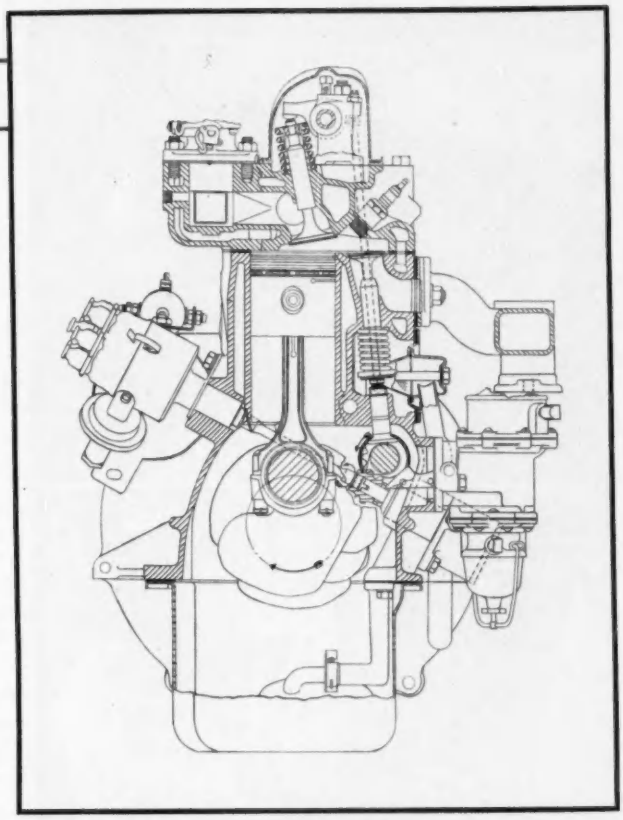
An oil filter and oil bath air cleaner are optional equipment.

A Carter downdraft, single-throat carburetor of 1¼ in. size is standard. Spark plugs—Champion J-8, 14 mm.—are located in the head on the right side. Vacuum-operated automatic spark advance with governor control is employed, spark advance being 19 deg at 2800 rpm under governor control.

The cooling system is of conventional type with a thermostatic by-pass to permit quick engine warm-up. A seven-lb pressure vent radiator cap is used. The fan is of four-blade assymetrical design to minimize noise.

The entire power drive is of cushioned type to promote smoothness and quietness of operation and freedom from vibrations sometimes transmitted into the passenger compartment. The power-plant has a three-point cushioned mounting in special rubber mounts having a basic frequency below that of the engine at idling speed.

Another feature contributing to freedom from external vibrations is found in the fact that the exhaust system from the manifold to the portion of the tailpipe immediately behind the muffler is suspended from the engine and thus moves with the engine on its mounts. The rear section of the tailpipe is suspended in rubber mounts.



Transverse section of the new engine showing arrangement of valves, distributor drive, etc.

Starting the engine is by means of the "Startakey" whereby starter is engaged simply by turning the ignition key to the extreme right.

A vacuum booster is optional on all models.

The transmission is the same as in current production. Clutch is 8½ in. diameter, single plate, dry type with sealed grease packed ball release bearing with torque rating of 147 lb ft.

Brakes are of four-wheel hydraulic type with 1⅛ in. diameter cylinder in front, 13/16-in. diameter cylinder at the rear. They are of internal expanding, two shoe floating anchor, self-centering type.

The rear axle is a modified version of the Spicer Model 23, semi-floating, hypoid gear type, with underslung spring seats. The following axle ratios will be available: 4.56 to 1; 4.1 to 1; 3.85 to 1.

As illustrated, the front suspension system is of coil spring type but differs from conventional mountings in the adoption of a double wheelhouse construction at the front end sheet metal to which the coil spring is mounted. The spring is mounted on a rubber seat fitted in a recess in the housing, the latter structure being responsible for carrying all primary load reactions. As shown, the lower end of the coil spring is mounted on top of the king pin support.

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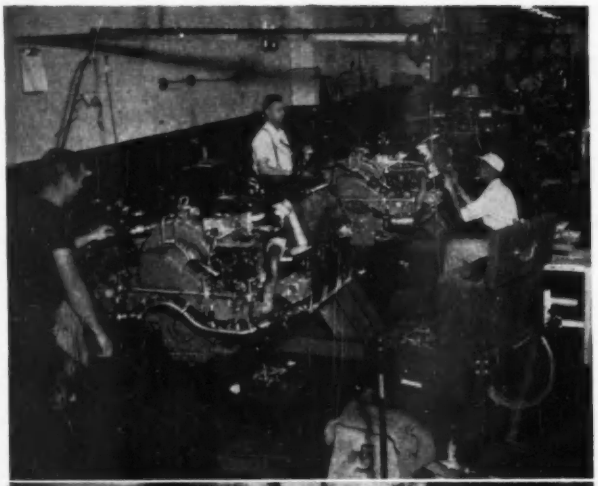
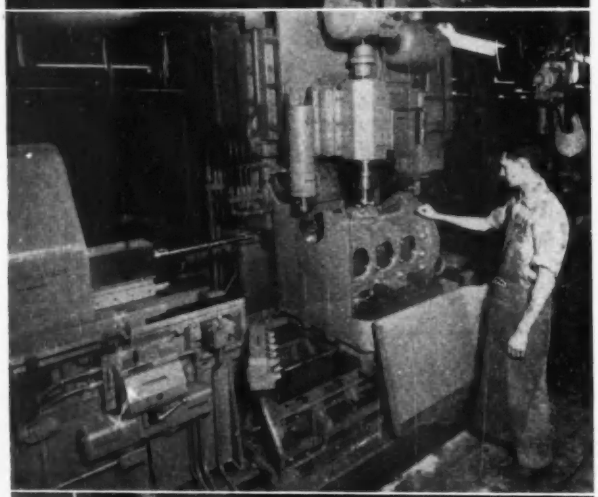




Production of

Tank Engine Crankcases

THE greatly accelerated tank production program has converted the Getty St. plant (Muskegon, Mich.) of Continental Motor Corp. into a real beehive of activity crowding the facilities originally designed for the start of 12-cylinder engine production (see AUTOMOTIVE INDUSTRIES, Feb. 15, 1950). The new equipment and new production lines, incident to the current expansion program, were installed for the manufacture of the six-cylinder, air-cooled military engines used in Walker Bulldog tanks.

This article is intended primarily as a pictorial highspotting of operations on the crankcase. The crankcase is processed in three stages—machining of each of the two halves, followed by machining of the assembly. One of the interesting features of the equipment in this department is the use of large Cincinnati Hydro-Tel millers for many major milling operations. Typical of this practice is semi-finish-milling of the joint face on one of the crankcase halves, illustrated here. The large diameter milling cutter is guided over the joint face contour under the influence of the automatic tracer, at the right, which, in turn, is guided around a full contour template.

According to the production experts

(Top)

Perspective of part of the final assembly line for six-cylinder tank engines.

(Center)

Close-up of three-station special Ex-Cell-O machine designed to handle various operations on the vertical and horizontal fan drive bores. In this view the center head is seen at work on the vertical bore. Horizontal boring is done with the head at the extreme left.

(Bottom)

Here is a view of the large W. F. & John Barnes three-way machine designed for gun drilling oil hole galleries in the crankcase.

By Joseph Geschelin

in this plant, the Hydro-Tel was found to be a natural on the crankcase job because of the flexibility of the machine and the facility with which many difficult milling operations could be handled. By using the tracer attachment and suitable template, it is possible to sweep contours of any complexity without interference from bosses or projections. It may be of interest to outline some of the major operations on one of the crankcase halves as well as the sub-assembly, at the same time tieing in with brief comment on some of the operations illustrated here. The summary is given at the right.

It should be noted that the outline is condensed and does not include all of the operations performed on this part.

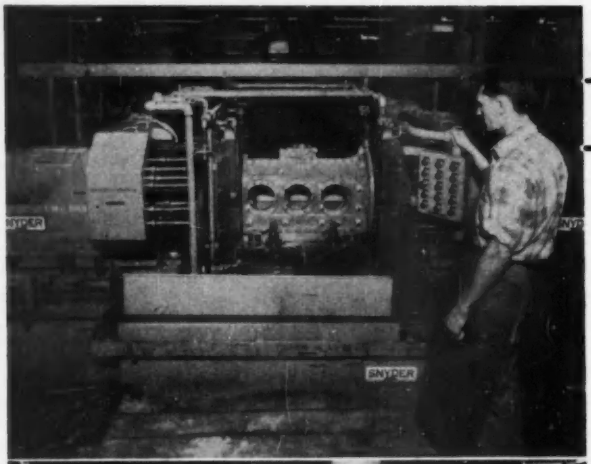
The last operation noted, lapping of the joint face, is representative of the advances made in equipment for facilitating the lapping of such large areas. It is done, as illustrated, on an 84-in. Crane Lapmaster, one of the largest machines of its kind in use today.

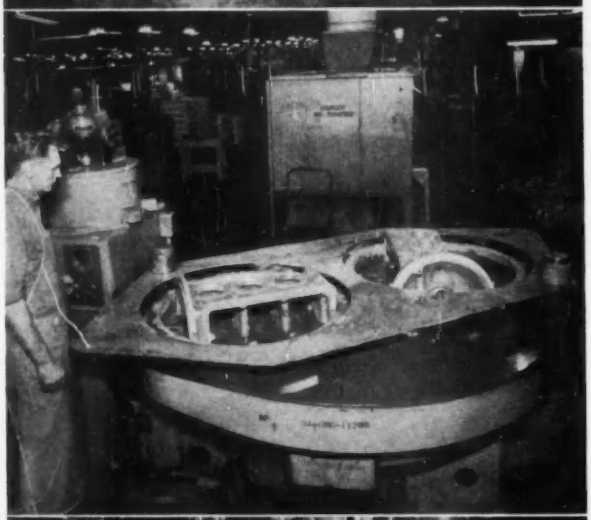
Some of the major operations on the crankcase assembly include—rough bore, counterbore, countersink, face and chamfer the vertical fan drive bore in preparation for the final operation on the special

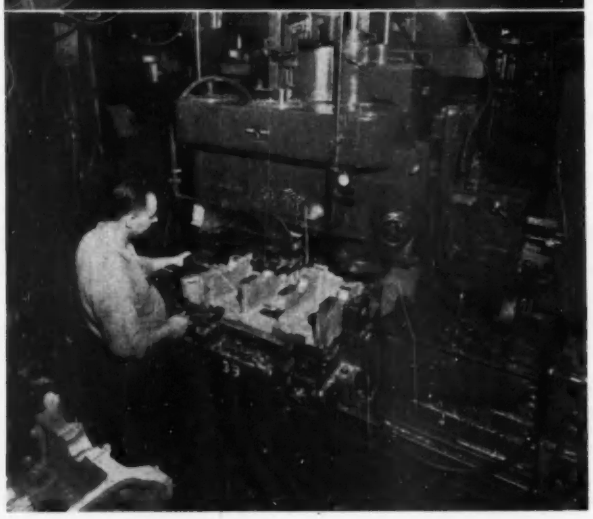
Operations on Crankcase

(1-3-5 Side)

OPERATION	EQUIPMENT
Rough mill joint face (use 12-in., 14-blade milling cutter with inserted cemented-carbide blades)	Cincinnati vertical Hydro-Tel
Rough mill pan rail	Cincinnati vertical Hydro-Tel
Rough mill cylinder deck	Cincinnati vertical Hydro-Tel
Rough bore four main half bearings, rough bore two seal diameters and face	Snyder special line boring machine
Rough profile mill flywheel end (profiling of half circle with cemented-carbide shell end mill)	Cincinnati vertical Hydro-Tel
Rough bore and chamfer cylinder bores	Heald Model 421 single end Bore-Matic
Stress relieve castings after rough machining	
Semi-finish fill joint face	Cincinnati vertical Hydro-Tel
Step drill 12 cross bolt holes	Natco 12-spindle drill
Semi- and finish-ream cross bolt holes	Natco 24-spindle double-end horizontal drill
Finish mill panrail bosses	3-36 Cincinnati Hydromatic tracer controlled mill
Drill 8 oil holes	Leland-Gifford two-way drilling machine
Drill 20 holes	Lee sperial 41-spindle Drill
Drill three oil gallery holes	W. F. & John Barnes three-way gun drill
Drill three oil holes	Leland-Gifford three-way, three-spindle drill
Finish flycut cylinder deck	Cincinnati vertical Hydro-Tel
Finish bore and chamfer cylinder bores	Heald No. 421 single-end three-spindle Bore-Matic
Drill, counterbore, and tap deck stud holes	Snyder special horizontal multiple-spindle drill
Finish flycut joint face	Cincinnati vertical Hydro-Tel
Lap joint face	Crane 84-in. Lapmaster







Tank Crankcases

Ex-Cell-O machine; semi-finish bore crank bores, finish counterbore, and finish face the seal hub in a W. F. & John Barnes horizontal line boring machine; finish face and turn both ends of the assembly in the massive 27¼ x 72 in. Monarch heavy duty lathe, using cemented-carbide tools.

The next operation, illustrated here, is finish boring, counterboring, countersinking, facing and chamfering the vertical and horizontal fan drive bores in a special four-head, two-way Ex-Cell-O precision boring machine. In operation, the middle head does the facing, boring, and other operations on the vertical bore. Then the fixture moves over to the left hand head which moves down into the work to provide support for the horizontal boring bar, the latter coming in to bore and face the horizontal bore. The work then is indexed over to the right hand head for milling the horizontal thrust bearing.

One of the largest and most impressive of the machines on this line is the 103 spindle Snyder special double-end drilling machine designed for drilling, counterdrilling, counterboring, countersinking, reaming, and tapping all holes in both ends of the assembly.

Later the crank bores are finish-bored

(Top)
One of the largest of the machines on the crankcase line is this 103-spindle Snyder—a special two-way machine—for drilling, reaming, tapping, etc., all holes in both ends. The work is moved progressively through three stations into the background.

(Center)
Joint faces of crankcase halves are lapped to fine finish and meticulous flatness in this big, 84-in. Crane Lapmaster. One of the largest of its kind, this lapper takes two halves at a time as shown.

(Bottom)
Typical of the installation of Cincinnati Hydro-Tel machines on the case line is this one, tooled for milling the joint face. This operation involves not only interrupted cuts but outline contouring as well. The large milling cutter is guided about and around the work by means of the tracer at the right, following the flat template.

(Continued)

This is one of the special long bed Norton Cam-O-Matics set up for grinding camshafts for both six- and 12-cylinder engines.

and thrust bearing finish-faced and chamfered in a W. F. & John Barnes horizontal line boring machine.

As a matter of special interest the familiar Norton Cam-O-Matic equipment, so widely used in cam grinding, is found in outsized form in this plant for grinding camshafts for 12- and six-cylinder engines. The illustration gives some impression of the size of these machines. To be more specific the camshaft for 12-cylinder engines is about 54 in. long, while the one for sixes is approximately 27 in. long. Both can be ground in the same machine.

Materials handling has been given close attention, employing gravity roller conveyor lines for inter-machine communication, industrial trucks for general transportation of parts and assemblies. Manual handling has been reduced on the machine lines by the installation of hoists mounted on pivoted tracks or rails at each of the big machines in the crankcase department.

• • •

Modern Handling Cuts Furnace Loading Time

MECHANIZED materials handling has reduced the loading time of five annealing furnaces from all day to two hours at the Fafnir Bearing Co., New Britain, Conn.

Fafnir uses its materials handling equipment in both standard and unusual ways. Virtually all parts are carried by fork lift or platform trucks at some stage of production. Trucks used for this purpose include 2000-lb capacity electric-powered Automatic fork trucks, equipped with rollover forks, and platform-type driver-led Transporters, made by the Automatic Transportation Co., Chicago.

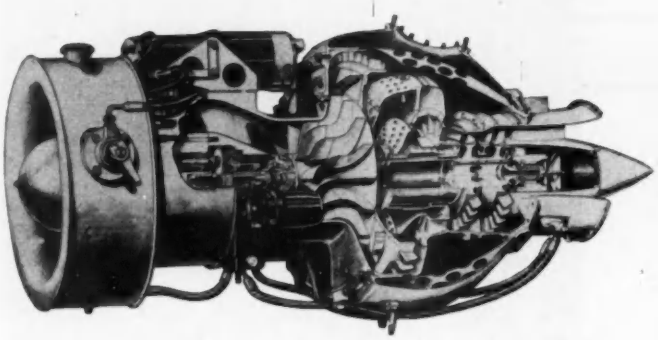
Typical operations include intraddepartmental runs of from 200 to 600 ft with bins of partly finished products. This operation, Fafnir reports, has saved a high percentage of handling costs.

The method of loading of the annealing furnaces with forged rings or hoods in cast-iron bins is a real time saver. An Automatic fork truck takes the bins and places them three in a row on the furnace car, which is then pushed into the furnace by the truck.

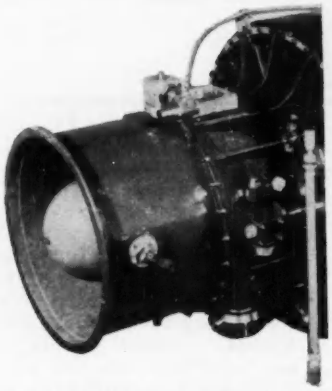
Another problem solved by mechanical methods is chip and scrap handling. Here, the Automatic's rollover forks are employed to dump the entire load directly into bins or highway trucks. This technique produced a considerable saving in handling, and it is said that the fork truck paid for itself in less than a year.

An Automatic Transporter is used to take bearing rings between the temporary storage and the washing, and grinding machines. The runs are from elevators from lower floors to the sections mentioned, which are on other floors. An average run is 200 ft. One Transporter and one man, per shift, handle the job which called for a four-man crew under the old system.

In Fafnir's Washington Street plant only one Transporter is used for several floors. A small elevator provided a bottleneck, but the Transporter was able to ride the elevator with its load and deliver it on any floor. The transportation maintenance foreman says that this was the only solution to the problem of mechanizing materials handling in the building.



Palouste I is a compressed air generator with a capacity of 2.3 lb of air per sec at 50 psi absolute delivery pressure.



The Marbore is a jet reaction turbine suitable for high speed aircraft such as target planes or guided missiles. Maximum thrust is 880 lb with fuel

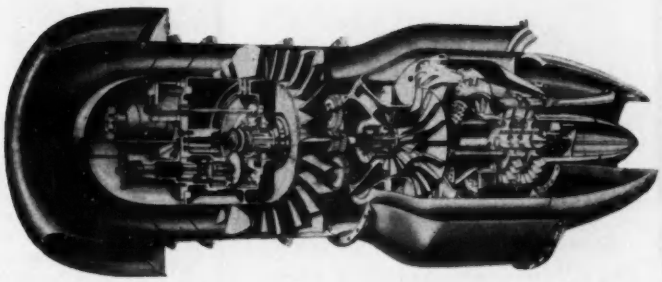
Gas Turbines Necessary For Small Aircraft Progress

By C. F. Bachle, Vice-President, Research
Continental Aviation and Engineering Corp.

STEADY progress in aircraft design has been achieved down to the present day with the personal aircraft development appearing to have reached a stagnation point, as illustrated in Fig. 1. With the advent of the turbine, however, a new avenue of development seems to have opened up which should break the stalemate and make the next major step of progress possible. Use of turbines radically departs from the piston engine tradition and the result will be greatly increased comfort, safety, and speed.

For the aircraft wing to produce lift, forward motion must be produced by some device able to produce thrust. All thrust in aircraft, whether propeller or jet, is the result of the same basic law of nature, "where there is action, there is reaction." The propeller is used to increase the velocity of a quantity of air. This increase in air speed across the propellers creates a force which is the action, while the pull imparted to the aircraft is the reaction. The jet machine utilizes the same principle, and the jet engine and the propeller-piston engine differ only in the pounds of air blasted out rearward and in the velocity imparted to the air. The propeller-piston engine moves a great quantity of air at small velocity increase, while the turbo-jet propulsion engine moves a relatively small quantity of air at a high velocity. In order to know how the turbine should be utilized, it is profitable to examine a special kind of power plant yardstick called "propulsive efficiency." This is concerned with the velocity with which the air is expelled rearward. Applying this to aircraft, the zero efficiency point corresponds to operation on the ground with the brakes locked, in which case the engine operates and produces thrust but accomplishes nothing useful since the aircraft does not move. At the other end of the propulsive efficiency scale, shown in Fig. 2, the power that can be produced is very small even though the efficiency is high; therefore, an oversize power plant results. It so happens that a turbine is able to give the high speed rearward blast necessary for high-speed flight with much greater efficiency than is the

consumption of 1.15 lb of fuel per hr per lb of thrust. This turbine is also useful to provide extra thrust for take-off on transport-type aircraft.



The Aspin ducted fan is essentially a shaft turbine in which the power is absorbed driving a very high speed multi-blade propeller forming an integral part of the machine. The air moved by this propeller, or fan, is ducted aft to a jet discharge. The characteristics of the machine are intermediate between a shaft turbine + propeller, and a pure turbo-jet

piston engine and propeller and this is the basic reason that jet-reaction turbines are used in our high-speed military aircraft. Conversely, in a slow-speed aircraft, the propeller is best since it is basically a low-velocity, large mass-flow producer. Between these two, the ducted fan has advantage in the mid-speed range, as further illustrated in Fig. 3. The power source by which these two devices accomplish the ends described above does not really matter. A piston engine and a turbine have each been used for both kinds of propulsion. Each kind of engine has its virtues and its faults, some of which will be considered.

The next factor to consider in evaluating the propulsive system is the engine itself or the energy-generating means. The present state of development of the turbine is such that the fuel consumption is greater than the piston engine. Within the foreseeable future, the fuel consumption of the small turbine will be improved to the point where there will be little difference in fuel consumption between the two, but this is some time off. In the meantime, there is no reason to delay turbine application to production aircraft since superior performance can be obtained using present turbines. Secondary advantage of the turbine, such as low weight, reduced frontal area, no cooling power loss, and other factors add up to enough advantage to more than offset the present high fuel consumption disadvantage. The curves of Fig. 3 illustrate the point that the turbine of either the jet reaction or ducted fan variety has less fall-off in thrust with increased speed than an engine connected to a propeller.

Before continuing further in the statement of the case for the turbine, it will be well to describe the various ways a turbine may be used. Fig. 4 shows diagrammatically how four varieties of thrust producers operate.

First, and simplest of turbines is the pure jet reaction-type as used by military aircraft. This is the power plant for high-speed aircraft and is a very poor choice for the aircraft in the 100 to 400 mph class be-

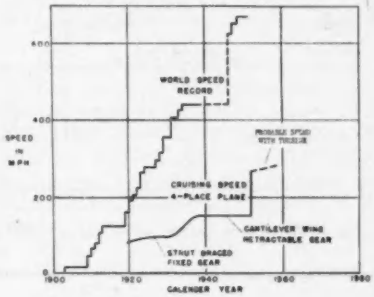


Fig. 1—Advance of airspeed since 1903.

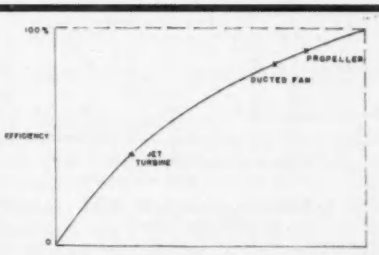


Fig. 2—Propulsive efficiency assuming a speed of 300 mph.

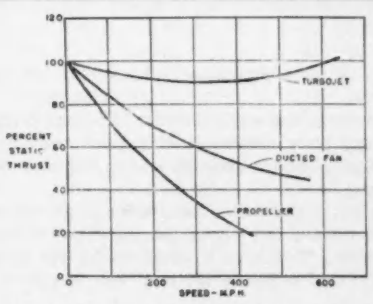


Fig. 3—Thrust vs aircraft speed for three types of propulsion.

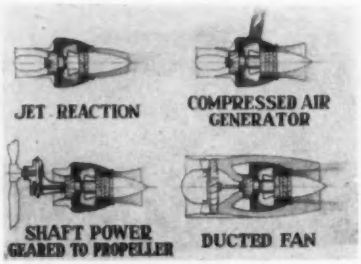


Fig. 4—These four methods of propulsion utilize the same basic turbine power unit.

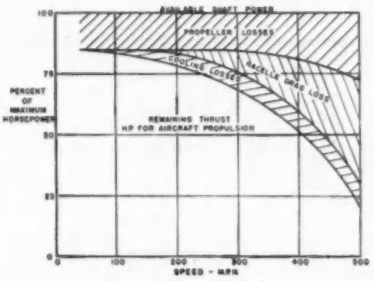


Fig. 5—Power losses; piston engine and propeller.

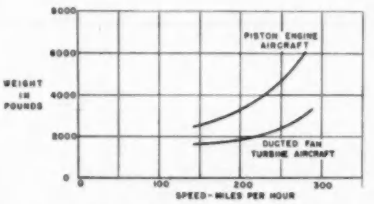


Fig. 6—Four-place aircraft gross weight. (Assumes 680 mile cruise).

cause of poor propulsive efficiency at low aircraft speeds.

Second is the shaft turbine. This type is excellent for any place where piston engines are now used; such as fixed-wing aircraft, helicopters, and convertaplanes.

Third is the ducted fan, which is the same as a shaft turbine but with a fan connected instead of a propeller. This type is excellent for the mid-speed range; that is 200 to 400 mph and, therefore, is the most prominent contender for the four-place commercial aircraft power plant since this is the natural speed range for this type aircraft.

Fourth is the air bleed turbine. In this case, the useful work is extracted from the turbine in the form of compressed air which can be used for special purposes, such as a helicopter with rotor tip jet thrust where the compressed air is led to the rotor tip and then directed rearward to give jet thrust. This type, and the ducted fan, may also be used for producing high lift from the aircraft wings at low speeds by boundary layer control.

All of these four types are essentially the same engine with various features added and this versatility is one of the attractions of the turbine.

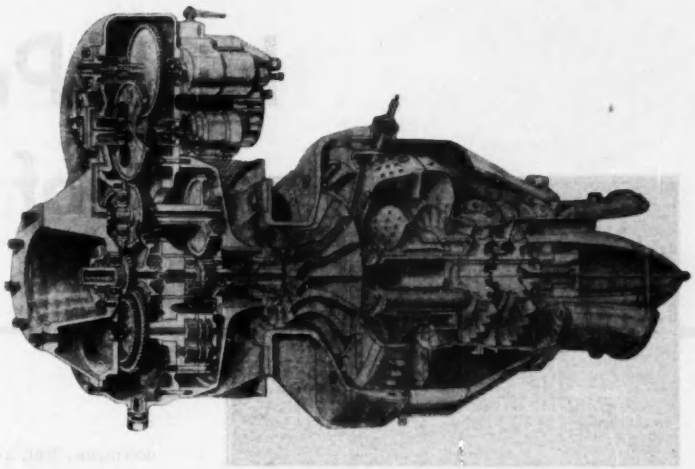
Examples of all four of these types have been developed and are now offered to the aircraft industry by Continental. These power plants are illustrated here.

All the turbines have common features which are: Single-stage, centrifugal compressor of 3½ compression ratio; annular combustor of extreme compactness and high efficiency; and axial-flow turbine having one-stage in the case of jets and two in the case of shaft turbines. Other features are: Fuel thrown out from the rotating shaft eliminating multiple spray nozzles with their high-pressure fuel systems; air-cooled turbine nozzle; link-type bearing support giving centralization of turbine rotating parts in the stationary housing under temperature expansion dimension changes; and very stiff turbine shaft resulting in freedom from vibration troubles. All these turbines have a long record of endurance running in France, which is the basis of the statement that the turbine will be more reliable than the piston engine even at the present state of development and, in the future, much improved life is expected.

Figure 5 shows the power losses in a typical piston-propeller aircraft, some of which can be avoided with the turbine. It is obvious that these losses may not be important at low speeds but at 300 miles per hour, 33 per cent of the engine power is wasted.

TABLE I

	Present Piston Engine	Ducted Fan	Piston Engine Aircraft to Duplicate Performance of Ducted Fan
Cruise speed	170	270	270
Cruise range—miles	680	680	680
Miles per gallon	18	5.8	4.2
Weight of aircraft	1625	1625	3400
Weight of power plant	600	300	1400
Horsepower—take-off	200	450	900
Weight of fuel required	230	700	970
Cost of aircraft (Estimated)	18,000	22,000	50,000



Artouste I is a shaft turbine of 280 hp weighing 185 lb. Fuel consumption is 1.02 lb per hp hr. Jet thrust of exhaust is 46 lb which at 300 mph corresponds to 13 per cent increase in power and 11 per cent less fuel consumption per hp.

Figure 6 summarizes the results of one study showing how the gross weight of aircraft varies with speed. In the case of the piston engine, various losses not present in the turbine make it necessary to use greatly increased power which, in turn, requires increased airframe to support it. The net result is an aircraft of at least twice gross weight for the same performance as compared with the ducted fan jet reaction turbine aircraft.

Summation of all these factors is shown in the results of one design analysis given in Table I.

Examination of this table shows that the use of the ducted fan results in an aircraft with all essential fentures about the same as present aircraft except a speed 60 per cent greater. A piston engine aircraft with performance equal to the ducted fan would require a reciprocating engine of 900 hp maximum (700 at cruise) and an airframe of considerably greater weight, the total resulting in greatly increased cost, as shown in the extreme right hand column.

The above article is an abstract of a paper presented recently at Aero Club of Michigan by Mr. Bachle.

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Metal Plating on Plastics

PHENOLIC, styrene, and vinyl plastics may be plated with a hard film of copper, silver, chromium or other metal by employing recently-developed mass production techniques. Metal plated items molded of plastics are more resilient and lighter than solid metal, and are said to be highly resistant to heat, abrasion, and weathering. They are particularly useful for replacing metal parts on automobiles, airplanes, and railroad cars.

In preparation for electroplating, plastic parts are first sandblasted or tumbled to roughen the surface and promote adhesion of the metal. Next, the article is dipped in a sensitizing solution and after it has been rinsed, is given a conductive bond coat of silver 0.00001 in. thick by chemical reduction in a spraying or immersion operation.

Bond coated items are put in perforated barrels made of laminated plastics, based on Bakelite phenolic resins, and revolved in a copper salt solution. Copper anodes furnish ions to the solution and these ions pass through the barrel's perforations to plate out on the objects tumbling about inside. Contact for the cathode connection is made through the bottom of the barrel which is insulated from the solution by the Bakelite phenolic.

Copper plate 0.002 in. thick can be built up on the plastic surface in about 12 hours. A thin coat of gold, silver, chromium, nickel, etc., is then plated over the copper base in another electroplating barrel to provide the desired finish.

The final step is mass polishing in tumbling barrels. Because of their light weight and resiliency, plastic articles are not marred in revolving barrels containing steel shot and soap solution. Gold, silver, and copper plate finishes are usually given a final coat of clear lacquer for additional protection. The process was developed by Plastiplate Co., Inc.

High Production of Steering

CHART A. Compositions of Carrier Gas of the Atmosphere in the Different Atmosphere Furnaces

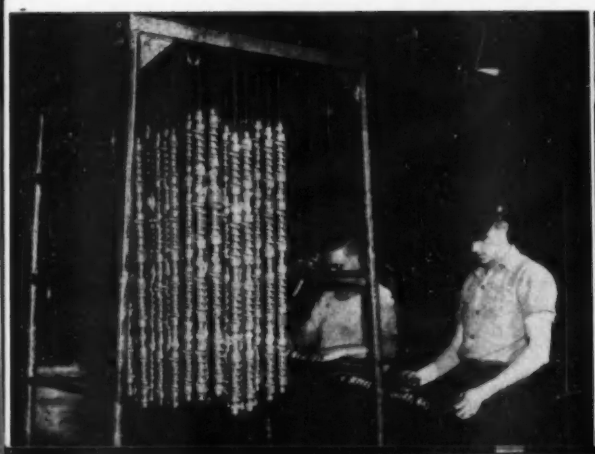
THE production of over 850,000 lb of steering assembly parts each month at Ross Gear & Tool Co. involves considerable heat treating under critical conditions imposed by both process and product. All of the vital and moving parts of every Ross steering gear are heat treated, and practically all of these undergo one or more of the three controlled atmosphere processes utilized in the plant—carburizing, cyaniding, and clean hardening.

Efficient production dictates that rejects be at an absolute minimum; therefore, heat treat results must be consistent within close limits. Production must be steady, therefore equipment must require a minimum of operator attention and practically no maintenance downtime. But, above all, overall equipment operation must be economical and the resultant product marketable. Field experience on many varieties of steered vehicles in many millions of miles of operations on highways and off-the-road operations has proved the dependability of the cam and lever steering gears, as produced by careful metallurgy and advanced heat treating equipment.

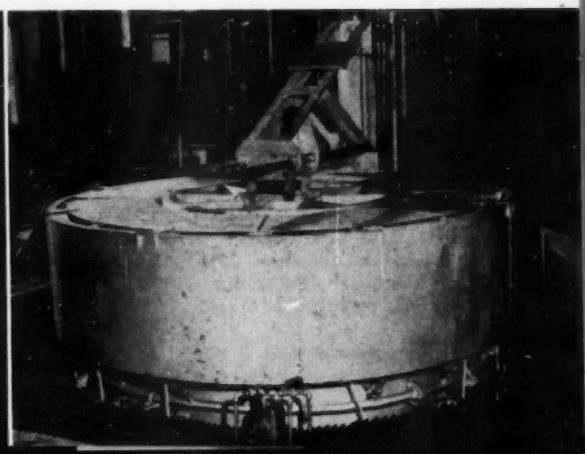
Steering assemblies made by Ross consist essentially of a worm or cam, lever shaft with studs, and steering arm with ball (see phantom view). All of these essential parts require critical heat treatment, utilizing prepared atmospheres. This article is devoted primarily to these parts since they constitute the most important ones so far as production heat treatment is concerned.

Undoubtedly, the most important single part in this assembly is the worm gear or cam. It is usually given the designation of cam, since its thread is not of constant pitch. In this cam it is the groove between adjacent threads that is the active element. This groove is tapered to correspond with the cone-shaped studs attached to the lever shaft end. As the steering column turns, the studs follow the grooves and rotate

Preparing a pit furnace charge of cams by stringing each part on a long rod which is suspended from a special fixture.

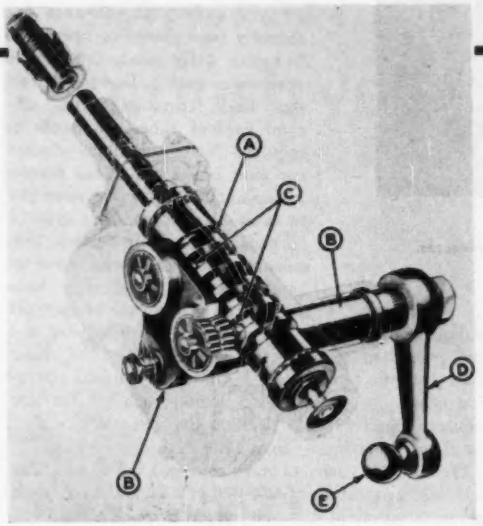


One of the pit-type radiant tube carburizers for heat treating steering cams.



Heat Treatment Gear Parts

By Geo. Goepfert
Chief Metallurgist
Ross Gear & Tool Co.
Lafayette, Ind.



Phantom view of Ross cam and roller type steering mechanism. (A) worm or cam, (B) lever shaft, (C) studs, (D) steering arm (E) ball.

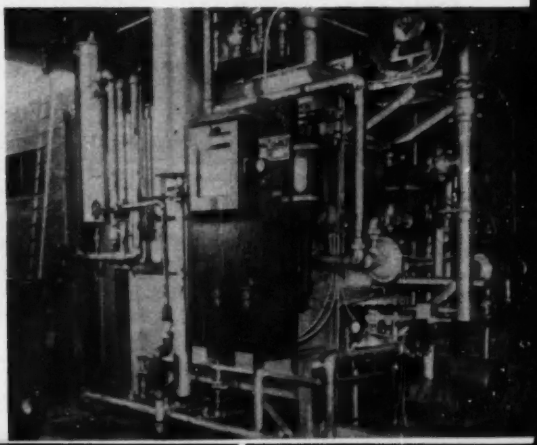
the lever shaft which in turn rotates the steering arm. To attain maximum strength and long life from these principal parts, the cams are carburized, the studs and ball studs dry cyanided and the steering levers and arms clean hardened. The remainder of the assembly parts undergo one or more of these three principal heat treatments. The heat treated parts, rendered dark in the phantom illustration, are typical of a cam and lever type steering gear assembly.

The heat treat department has been developed around a basic plan that utilizes available space and incorporates the best in furnace equipment. A high rate of production is maintained by integrating the plating and mechanical cleaning operations and equipment with the heat treating furnace equipment. Work flow is built around three principal heat treat processes—carburizing, dry cyaniding and clean hardening—that account for practically all of the vital parts included in each complete steering gear assembly (see chart A-1).

The cam or worm gear is probably the most critical part of each steering assembly. These steering cams are generally made from SAE-8620 steel and carburized, in four Surface Combustion radiant tube pit-type controlled atmosphere furnaces. They are loaded in "strings" of several cams hung on long rods. These rods are suspended from a special fixture and this fixture, with load, subsequently suspended directly under the pit furnace covers. Special lugs, attached to the top rim or lip of the furnace heating chamber, hold the work fixture and load. Each furnace load contains about 1500 lb net, depending on the size of cam being treated. Effective internal working dimensions of each pit heating chamber, exclusive of the vertically suspended radiant tubes, is 36 in. diameter and 48 in. depth.

Just previous to this carburizing treatment, each cam is copper plated on one end. By preventing carburization at this point, a subsequent welding operation can be performed in order to join this cam to the main steering wheel tube. The entire plating operation is carried out in a unique plating department designed and developed by Ross' Metallurgical Department. This room, located immediately adjacent to the main

One of two 2400 cfh RX generators constituting central source for carrier gas.



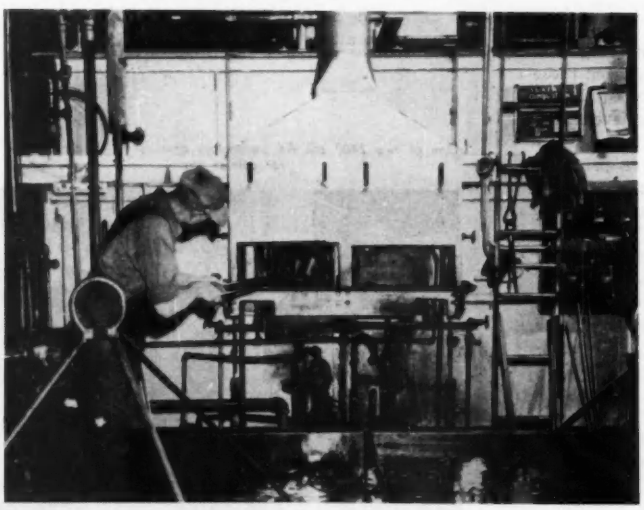
Process	Carburize	Dry Cyanide		Clean Harden
Parts	Worm Gears, SAE-8620	Ball Studs, SAE-8620	Studs, SAE-8620	Lever Shafts, SAE-8645, 1040 Steering Arms, SAE-1040, 8645
	(1500 lb net load)	(250-300 lb/hr)		(1000 lb/hr)
Heat Treat Cycle	1. Copper plate end 2. Heat to 1700 F 3. Hold for 7 to 9 hr 4. Furnace cool to 1575 F 5. Hold for ½ hr 6. Quench in oil 7. Draw at 325 F for 1 hr	1. Heat to 1575 for 1-1½ hr 2. Quench in oil	1. Copper plate 2. Parts previously carburized 3. Heat to 1530-1550 F for 1-1½ hr 4. Quench in oil 5. Draw 325 F. 1 hr	1. Heat to 1550 F 2. Hold for 15 minutes at temperature 3. Quench 8645 in oil and 1040 in water 4. Draw at 900 F to 1160 F
Results	Hardenable case depth of 0.040 in.	Case depth, 0.010-0.015 in.	Case depth, 0.008 in.	

Chart A-1. Work Flow for Three Principal Heat Treating Processes.

heat treat room, handles about 80 per cent of all copper and cadmium plating requirements within the plant.

After plating, the cams are loaded in one of the four pit carburizing furnaces, heated to 1700 F in an enriched RX prepared atmosphere, and held for seven to nine hours, depending on size of cam. The load, while still in the furnace, is cooled to 1575 F, held for ½ hour, removed from the furnace and direct quenched in oil. Total cycle: 11½ to 14 hours. A minimum hardenable case depth of 0.040-.060 in. is produced.

Radiant tube rotary hearth furnace for clean hardening steering arms and levers.



The cams are next washed, given a 100 per cent hardness test to a minimum specification of 58 Rockwell "C", and then drawn at 325 F for 1 hr. This is followed by a mechanical cleaning and a 100 per cent file test for "soft" skin. At this point, these worm type steering cams are ready for their final grinding operation.

The fourth Surface Combustion pit-type carburizing furnace has recently been placed in operation, bringing daily production up to required capacity. Due to the fact that these furnaces utilize efficient radiant tubes, no muffle is required and maximum charge per load is realized. This results in the handling of more work per sq ft of floor space. This type of furnace also permits vertical suspension of an otherwise hard-to-handle part. Special alloy fans are located in the base of each pit and serve to circulate the carburizing atmosphere and thus permit uniform heating of the charge and closer control of the temperature. Under continuous operation conditions (1500 lb net loads) each pit furnace requires about 286 cfh of 1000 Btu natural gas during the carburizing cycle at 1700 F.

The first pit furnaces were equipped with integrally built RX generators of 250-300 cfh capacity but with the installation of the last pit, two manifolded 2400 cfh RX generators are utilized for all atmosphere requirements in the heat treat department, including these pit furnaces.

The studs and ball studs, in actual service, are subjected to a considerable frictional wear in addition to impact stress. The studs roll and slide against the sidewalls of the roller cam grooves as they move along its length. This motion, transferred along the lever shaft to the steering arm ball in turn causes the ball to slide in a socket on the steering knuckle.

To impart the optimum physical properties to the wearing surface of these vital parts, they are subjected to a gas cyaniding treatment in a Surface Combustion controlled atmosphere continuous articulated link belt furnace. This furnace is equipped with radiant tubes, of the same type used in the pit furnaces, and a magnetic vibrator feeder. This

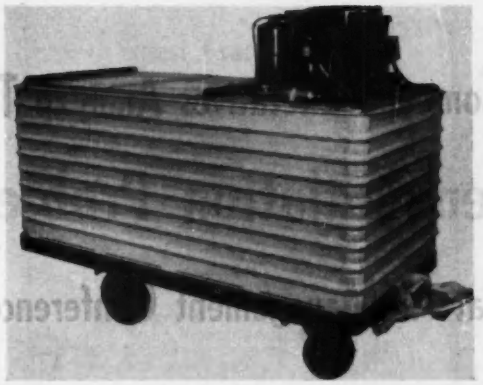
(*Turn to page* 90, *please*)

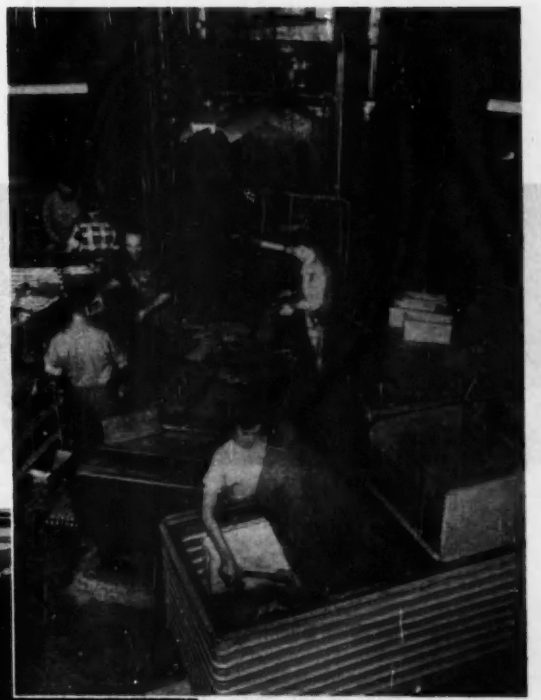
Refrigeration

Finds Wider Use In

Aircraft Industry

By James D. Thomas
Asst. Supt. of Fabrication & Paint,
Douglas Aircraft Co., Inc.,
El Segundo Division.

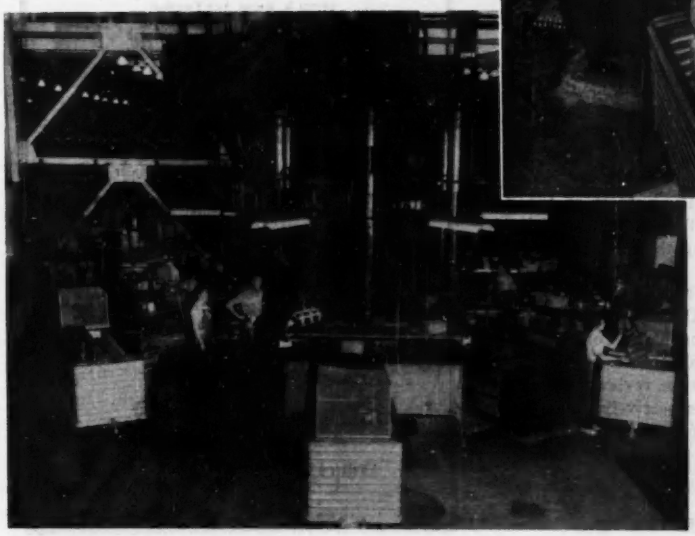




FOR many years refrigeration has been used in the aircraft industry for such purposes as holding rivets at very low temperatures. This was necessary to retard the heat treatment of aluminum alloys to attain full hardness after the rivet was actually used. Other minor uses also have prevailed.

Today the extensive use of harder alloys of aluminum has encouraged much greater uses of

(*Turn to page 84, please*)



(Top) Portable refrigeration unit designed by the El Segundo plant engineering department.

(Above and left) Views showing parts being loaded into 3000-ton hydraulic press from portable refrigerators.

Company Executives Analyze Their Renegotiation Problems at AI Management Conferences

By James R. Custer

Guest Executives at Pittsburgh Conference

Jessop Steel Co., Washington, Pa.
Wm. C. Stumpf, Jr., Secretary & Controller
C. L. Davies, Assistant Treasurer

Pittsburgh Plate Glass Co., Pittsburgh
C. R. Fay, Comptroller

Gulf Oil Corp., Pittsburgh
Gordon B. Brown, Supervising Accountant
W. C. Kernahan, Advertising Dept.

Koppers Co., Inc., Pittsburgh
Templeton Smith, Assistant Counsel
Charles G. Strang, Staff Finance Dept.
Richard C. Carr, Asst. Dir. Public Relations
James Bryen, Staff Accountant

Aluminum Co. of America, Pittsburgh
E. J. Peck, Administrative Accountant
W. C. Johnston, Accountant

National Tube Co., Pittsburgh
F. L. Wiegand, Jr., Secretary & Gen. Atty.
T. W. Gamble, Advertising Assistant

Latrobe Electric Steel Co., Latrobe
George D. Billock, Assistant Treasurer
A. G. Wallerstedt, CPA

Continental Commercial Corp., Pittsburgh
George W. Hogue, Vice President

Pittsburgh Steel Products Co., Pittsburgh
G. Herbert Keisling, Asst. Comptroller
Fred J. Smith, Tax Accountant

Motive Parts Co., Pittsburgh
Charles J. Dygate, President

Allegheny Ludlum Steel Corp., Pittsburgh
T. Ames Wheeler, Controller
Wm. A. Kirkpatrick, Asst. to Controller
C. B. Templeton, Mgr. Sales Promotion

United States Steel Co., Pittsburgh
Paul W. Kearney, Executive Assistant
C. N. Schmidt, Asst. Dir. of Adv.

Kennametal, Inc., Latrobe
C. R. Van Norden, Tax Manager
Ray W. Senogles, Auditor

The Iron Age, Pittsburgh
J. M. Spackman, Regional Business Mgr.

Rockwell Mfg. Co., Pittsburgh
M. J. Carl, Treasurer

Reed, Smith, Shaw & McClay, Pittsburgh
P. J. Winschel, Associate

Walker & Downing, Pittsburgh
C. P. Richardson, Vice President

SINCE AUTOMOTIVE INDUSTRIES began four months ago to sponsor a series of regional management conferences as an editorial extension service for industry, sessions have been held in six industrial centers and attended by 171 executives from 91 companies, trade associations, and other organizations. The subject of these conferences is Renegotiation under the 1951 Act, the interest being manifested in it proving the need for them and assuring their success.

So far seven meetings have been held in Philadelphia, Hartford, Buffalo, Cleveland (two), Cincinnati, and Pittsburgh. Future meetings are being considered for Dayton, Chicago, Detroit, and other industrial centers. The Philadelphia and Hartford conferences were reviewed in the October 15 and December 1 issues, respectively, of AUTOMOTIVE INDUSTRIES. On this and the following three pages is presented a pictorial coverage of the other five meetings.

Kenneth G. Smith, renegotiation adviser to AUTOMO-

(*Turn to page* 56, *please*)

How to Protect Yourself for Renegotiation

By Kenneth G. Smith

New England Executives Confer on RENEGOTIATION

RENEGOTIATION

Needs Salesmanship

Skilful Preparation and Presentation of Renegotiation Reports Are Important to Prove Efficient Profits. Key Executives from Philadelphia Area Discuss Defense Contracts Under 1951 Act.

Reproduced here are titles of three articles on renegotiation that have been published in Automotive Industries, beginning with "How to Protect Yourself for Renegotiation" in the July 15, 1951 issue. The other two articles reported on the Philadelphia and Hartford conferences.

Kenneth G. Smith at first Cleveland conference explaining principles outlined by him in article "How to Protect Yourself for Renegotiation," from Automotive Industries.

Guest Executives at First Cleveland Conference

Osborn Mfg. Co., Cleveland
H. W. Fox, Treasurer
R. R. Schultz, Advertising Manager

Wean Equipment Corp., Cleveland
George J. Ridgeway, Secretary

American Steel & Wire Co., Cleveland
James A. Wadsworth, Accountant
Gordon A. Paul, General Ledger Supervisor

Motch & Merryweather Machinery Co., Cleveland
Henry A. Murton, Assistant Treasurer
W. J. Eybsen, Assistant Treasurer
W. F. Edwards, Auditor

National Acme Co., Cleveland
T. L. Strimple, Secretary
L. E. Honeywell, Advertising Manager

Thompson Products, Inc., Cleveland
E. J. McGeough, Assistant Controller
Lawrence J. Kerwin, Staff Accountant

Lincoln Electric Co., Cleveland
G. F. Clipsham, Asst. to President
R. J. Van Dame, Controller
Grace Roth, Asst. Supervisor Order Dept.

U. S. Steel Wire Spring Co., Cleveland
W. J. Kimpel, Sales Manager
R. C. Kenat, Office Manager

Yoder Co., Cleveland
F. R. Sargeant, Executive V. P. & Treasurer
E. H. Kanzenbach, Secretary
James Dalgleish, Asst. Sec.-Treas.

Wellman Bronze & Aluminum Co., Cleveland
Martin O'Malley, Cost Accountant
Robert J. Leaver, Representing Counsel

Eaton Mfg. Co., Cleveland
A. C. Paterson, Asst. Controller
M. McKibbin, Asst. Controller
A. P. Gram, Credit Manager

B. F. Goodrich Chemical Co., Cleveland
L. L. Keener, Mgr.-Billings, Cashier, Credit

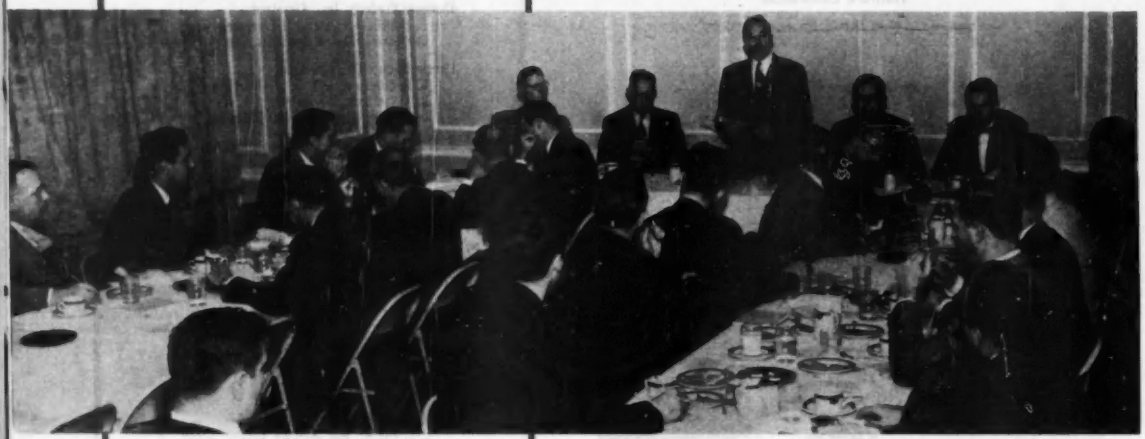
National Machine Tool Builders Assoc., Cleveland
Robert H. McGrath, Asst. to General Manager

Gray Iron Founders Society, Cleveland
W. M. Caldwell, Asst. Secretary

Renegotiation Conferences

(Continued)

TIVE INDUSTRIES, addressed the conferences and conducted the discussions, during which many of the executives presented their renegotiation experiences and problems. Using the material in the two articles, "How to Protect



Guest Executives at Cincinnati Conference

Lodge & Shipley Co., Cincinnati
Ralph W. Miller, Secretary & Controller
William Ott, Cost Accountant

Morris Machine Tool Co., Cincinnati
Clifford R. Meyer, Secretary

Standard Electrical Tool Co., Cincinnati
Wm. A. Ferguson, President
Ray A. Kuhn, Secretary

Homan & Co., Inc., Cincinnati
David K. Homan, Vice President
John J. Martin, Comptroller
L. A. Dolries, Secretary

Avey Drilling Machine Co., Covington, Ky.
D. M. Patterson, Vice President
Warren R. Lowe, Counsel

Charles A. Maish Co., Franklin, Ohio
Morris S. Hurwitz, Auditor

Cincinnati Milling Machine Co., Cincinnati
E. W. Mueller, Asst. Treasurer.

Trailmobile, Inc., Cincinnati
George T. Pfifer, Plant Controller
John O'Toole, Cost Accountant

American Steel Foundries, Cincinnati
W. W. Palmer, Asst. Works Auditor
(King Machine Tool Div.)
Charles H. Hippchan, Chief Clerk
(Elmes & King Div.)

Aluminum Industries, Inc., Cincinnati
Robert Smethurst, CPA
Frank C. Callahan, CPA

Owens-Corning, Fiberglas Div., Cincinnati
W. E. Pierce, Branch Manager

Routzohn, Routzohn and Nevin, Dayton
Robert S. Nevin, Partner

Graham Hopkins & Associates, Dayton
Graham Hopkins, President

C. D. Bochme, Mfgrs. Rep. to USAF, Dayton

Guest Executives at the Buffalo

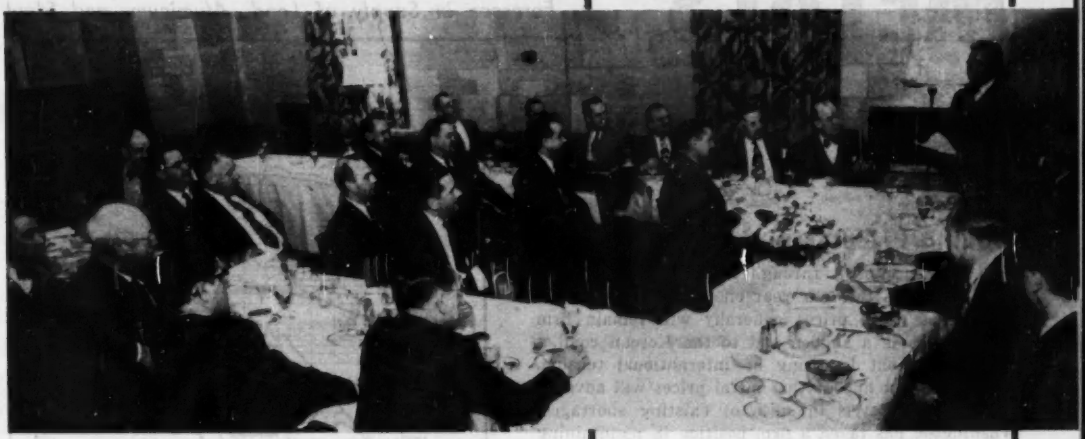
Frontier Bronze Corp., Niagara Falls
E. H. Holzworth, President
W. A. Graham, General Manager

Warman & Co., Inc., Buffalo
R. B. Warman, President
H. M. Sattler, Accountant

Rigidized Metals Corp., Buffalo
Robert G. Leary, Vice President
W. W. Adams, Purchasing Agent

Buffalo Forge Co., Buffalo
Arthur M. Kiely, Controller & Director
M. E. Reiner, Asst. Controller
Theodore M. Dillaway, Asst. Secretary
Fred B. Stubinger, Advertising Manager

Wales-Strippit Corp., North Tonawanda
C. F. Michel, Secretary-Treasurer
R. W. Kimball, Assistant Treasurer



Yourself for Renegotiation" and "Renegotiation Needs Salesmanship" as the basis of his talks, Mr. Smith explained the principles outlined in them and presented specific cases to illustrate the problems.

He emphasized the importance of starting sales segregation immediately and in lieu of that for 1951 the acceptability of certain sampling methods for prorating defense contract and commercial sales. The necessity of thorough cost studies was pointed out to substantiate efficient profits as against excessive profits. He also advocated that each company maintain an adequate renegotiation file of material to be used to prepare a complete renegotiation report, which he said could be more important than the annual report of the company as renegotiation is in reality a super tax on profits.

Conference—*(No Photograph Available)*

Lake Erie Engineering Corp., Buffalo
M. E. Peer, Controller

Wiesner-Rapp Co., Buffalo
Edwin F. Rapp, Vice Pres. & Treasurer

Van Der Horst, Olean
B. J. Bordonaro, Chief Accountant

Dittmer Gear & Mfg. Corp., Lockport
A. H. Dittmer, President

Niagara Machine & Tool Works, Buffalo
G. E. Munschauer, Vice President
Reeve W. Dean, Asst. to President
Franklin A. Reed, Sales Manager

Horace A. Laney Agency, Buffalo
Horace A. Laney
Harvey Laney
Tom Bromley, Production Mgr.

Guest Executives at Second Cleveland Conference

Ohio Piston Co., Cleveland
Don P. Shaw, Vice Pres. & General Manager
Wallace K. Sidley, Asst. to General Manager

Hill Acme Co., Cleveland
Karl Bruch, Treasurer

National Screw & Mfg. Co., Cleveland
W. W. Stewart, Controller
Michael F. Welly, Internal Auditor

Cleveland Container Co., Cleveland
S. W. Broka, Secretary

Jack & Heintz, Inc., Cleveland
J. R. Callahan, Treasurer
John W. Kemper, Comptroller

Parker Appliance Co., Cleveland
E. L. Dumas, Comptroller
Warner B. McCarthy, Staff Accountant

Warner & Swasey Co., Cleveland
C. W. Bliss, Treasurer
T. B. Allen, Accounting Dept.

Leece-Neville Co., Cleveland
P. H. Neville, President
J. S. Allt, Secretary-Treasurer

American Steel & Wire Co., Cleveland
Charles H. Kraft, Credit Repr.

Electric Products Co., Cleveland
R. J. Berry, President
A. P. McDiarmid, Asst. to President

Ohio Crankshaft Co., Cleveland
W. R. Forsythe, Comptroller
Lester C. Lemke, Tax Accountant

Timmerman Products, Inc., Cleveland
John A. Clark, Controller

National Acme Co., Cleveland
R. E. Channock, Comptroller

Standard Products Co., Cleveland
R. C. Zook, Div. Controller (Port Clinton Div.)
E. C. Moody, Asst. to Treasurer
Charles J. Shannon, Asst. to Controller (Reid Div.)

METALS

Metal Prices Expected to Remain Firm. Improvement Foreseen in Supply of Lead, Aluminum, and Steel

By William F. Boericke

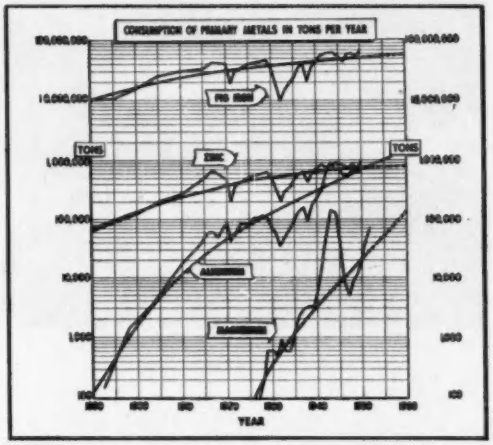
Ceiling Prices Maintained

Peering cautiously through the murky atmosphere that enshrouds the new year one comes up with the belief that metal prices generally will remain firm unless there is a sudden end to the Korean conflict with consequent lessening of international tension. But it does not appear that metal prices will advance from present levels in spite of existing shortages. Washington has taken a firm position in maintaining OPS ceilings although metal prices abroad have been higher than in this country and in some instances—notably for nickel, sulphur, and copper—fantastically higher. Although the metal trade believed that OPS would be obliged to raise its ceiling price for copper from 24½ cents a pound to at least the 27½ cents permitted for copper produced abroad and sold in this country, they have thus far succeeded in holding the line although deliveries to the stockpile were deferred and the Government reluctantly had to release 55,000 tons to relieve the critical shortage.

The attitude of Washington seems to be that by maintaining ceiling prices in this country that are lower than markets abroad, upward pressure on world prices would be relieved through removal of American buyers from the foreign markets and a growing oversupply abroad would eliminate premiums and ultimately increase exports to this country. Thus far this hoped-for development has not materialized to any extent, although there are some signs that foreign buyers are becoming increasingly reluctant to pay higher prices for lead and it is believed that premiums may gradually disappear for this metal early in 1952. The foreign price of lead has already eased about one cent a pound to 21½ cents compared to the domestic ceiling of 19 cents.

To a lesser degree the same thing is true of zinc which has been selling at 29-30 cents a pound abroad against 19½ cents in the United States. There is no doubt that world zinc production in 1952 will show a substantial increase over 1951, particularly in Canada where Quebec mines will contribute heavily, as well as from Peru, Australia, and Africa. Expansion in domestic output from Idaho, Washington, and Tennessee is also expected.

Domestic shipments of slab zinc were about 850,000 tons in 1951. More would have been shipped if it had been available but the metal wasn't to be had. Imports of slab declined during the year and the Government had to defer deliveries to the stockpile which totalled only 42,000 tons for the year contrasted with 125,000 tons in 1950. But producers took some comfort from



This chart, reproduced from Dow Magnesium Topics, shows the consumption of four primary metals in the United States from 1890 and projected to 1960.

a slight increase in stocks at the end of the year, up about 15,000 tons since January, although still far below normal.

Improvement in Lead Supply

The lead situation remained tight all through the year with consumers frantic for more metal. Some relief was finally obtained in November by release of 30,000 tons from the stockpile, to be allocated about 10,000 tons a month and to be repaid to the stockpile as soon as possible.

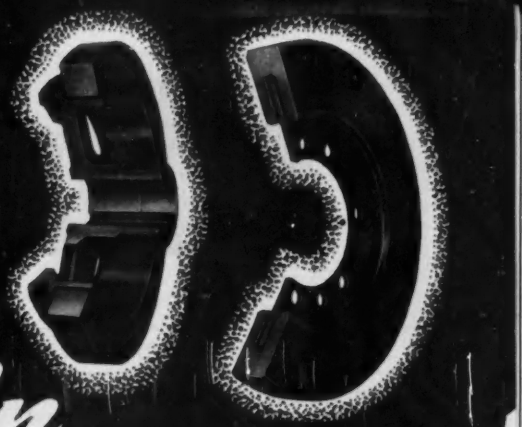
The outlook for 1952 is for improvement. Normally about one-third of domestic supplies comes from mine production, one-third from scrap, and one-third from imports. Mine production has been hampered all year by labor shortage and recently by a long drawn-out strike at the important Herculaneum lead smelter. Deliveries of scrap have been small because of dealers' reluctance to sell while higher prices prevailed abroad. They are expected to increase after the first of the year. Lead imports were off 50 per cent in the January-September period but should increase considerably in 1952. Suspension of the lead tariff when Congress convenes is expected to provide further relief.

Copper Producers Worried

The enormous increase in aluminum production, actual and potential, has caused copper producers considerable concern. While always admitting the possibility of competition from aluminum, the day seemed far distant when it would arrive. But looking ahead

(*Turn to page* 94, *please*)

SCHWITZER-CUMMINS COMPANY...



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Our long years of service to the industry on internal combustion engines of all types, large and small—oil and gasoline, have developed a rich fund of experience with dampers and a knowledge of what to do and how to do it in designing and building. You will find this experience invaluable in any damper problems you may have and you will find it on tap for you if you think we can assist you in your damper design or as a supplier.

Our production facilities cannot be excelled and are constantly being increased. We can serve you well as a damper source and would like to do so. You want either improved, smoother performance for your engine, or a superior damper at a saving. We can give you both and take good care of your production needs. May we hear from you?

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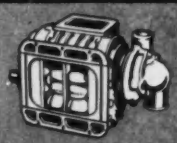

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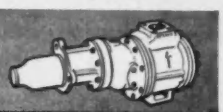

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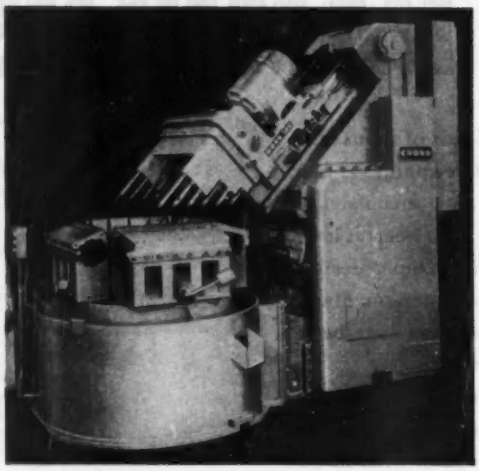
FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 62

J-1—Cylinder Head Machine

A special machine tool for drilling and chamfering cylinder heads has recently been delivered to a large automotive company by the Cross Co., Detroit, Mich. The machine drills 12 angular holes and counter-sinks eight manifold mounting holes in 170 pieces per hour at 100 per cent efficiency. One unskilled operator is required.



Cross cylinder head finishing machine.

An outstanding feature of the machine is the Cross heavy duty index table. This incorporates a manual as well as an automatic control cycle. On the Cross unit, fluid motor drive is said to prevent damage to the table.

Other features include hardened and ground ways, hydraulic feed and construction to J.I.C. standards with stranded wire electrical installation.

J-2—Hydraulic Press

The E. W. Bliss Co., Toledo, Ohio, has put out a double-action hydraulic press that has many design innovations to speed production and control quality. For example, the press has two speeds in addition to its quick advance speed. The fast draw is done with 250 tons, using the main cylinder only; the slow draw with 500 tons pressure using main and three additional cylinders. Blankholder pressure is adjustable at all four corners.

A pressure switch safety feature prevents descent of plunger until blankholder pressure has been registered on all four corners. Converted to a single action press, full 750 tons capacity is available.

(*Turn to page 64, please*)

News of the Machinery Industries

For Increased Output

To further increase machine tool production capacity for broaching machines and hydraulic presses, a large horizontal boring mill, an equally large planer and other heavy duty grinding and machining equipment as well as a 20-ton crane have been installed in the new addition to the Colonial Broach plant in Detroit. This recently completed addition, which increases machine construction plant area 30 per cent, houses expanded machine shipping, machine painting and machine assembly facilities.

Machine Design

Machine designers of the Ohio, Pennsylvania and Michigan area will compare notes on defense production at the Ninth Annual Machine Design Conference to be held Monday, February 4 at the Cleveland Engineering Society in Cleveland. Following the conference theme of "Modern Developments in Machine Design," the all-day sessions will cover such subjects as hydraulic torque converters, tracer control, cutting, tensioning and winding, and discussions of machine elements.

Training Program

As a practical means of encouraging young men to secure training to prepare themselves for industrial careers, 10 annual scholarships have been offered by Utica Drop Forge & Tool Corp. The scholarships provide for two school years of training at the State University of New York.

Dutch Branch

Cincinnati Milling Machine Co. is extending its operations to Holland. A new Dutch company, Cincinnati Milling and Grinding, N. Y., has been formed and will build an assembly plant at Vlaardingen, near Rotterdam. Component parts for the machines to be built in Holland will be supplied by the home operation in Cincinnati, the same procedure as is followed with the company's subsidiary plant in England.

Export Organization

Norton Co. and its Behr-Manning Corp. Div. have announced the formation of a new company, Norton Behr-Manning Overseas, Inc. This organiza-

(*Turn to page 72, please*)

Chrome Sweet Chrome

The application of solid chrome plating to piston rings, perfected by Perfect Circle, more than doubles the life of pistons, rings and cylinders. Performance data will be furnished upon request.

Perfect Circle

PISTON RINGS

The Standard of Comparison

PERFECT CIRCLES
are Preferred by
21 of 25 Leading Engine
Manufacturers
Using Chrome Rings

Publications AVAILABLE

New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

H-1 Temperature Control

Barber-Colman Co.—A four-page bulletin. F-4869, has recently been released on the firm's aircraft temperature control system—Micropulse.

H-2 Cutter Drive

Cross Co.—Descriptive literature on the new Cross-Drive is available.

H-3 Heat Treating

Hevi Duty Electric Co.—Announced is a manual entitled "Maintenance Guide for Electric Heat Treating Furnaces."

H-4 Lubricants

Chicago Mfg. & Distributing Co.—CMD multi-purpose lubricants for machinery components are described in a four-page pamphlet.

H-5 Testing Machine

Baldwin-Lima-Hamilton Corp. — The new Baldwin Sonntag model 12-H universal testing machine of 12,000 lb capacity is presented in Bulletin 336.

H-6 Rivet Setter

Chicago Rivet & Machine Co.—Model 214 double rivet setter with pneumatic control is described and illustrated in literature recently released.

H-7 Shop Equipment

Standard Pressed Steel Co.—A folder describing its Hallowell line of steel shop equipment has been prepared.

H-8 Services

American Silver Co., Inc.—Bulletin 9B describes the products and services offered by the company.

H-9 Plastics

Plaskon Div., Libbey - Owens - Ford Glass Co.—Bulletins A-3, A-4 and A-7 on molded Plaskon alkyd, suited for automotive ignition parts, have been released.

H-10 Wing Nuts

Gries Reproducer Corp.—Recently issued is a bulletin on GRC zinc alloy wing nuts.

H-11 Testing Equipment

General Electric Co.—An 80-page catalog summarizes the company's testing and measuring equipment for laboratory and production line use.

H-12 Drawing Compounds

E. F. Houghton & Co.—The physical properties and applications of drawing compounds for every type of drawing operation are included in a revised edition of "Drawing Compounds by Houghton."

TIME SAVER COUPON

THIS TIME SAVER COUPON is for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

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Your Company Connection or Business .....

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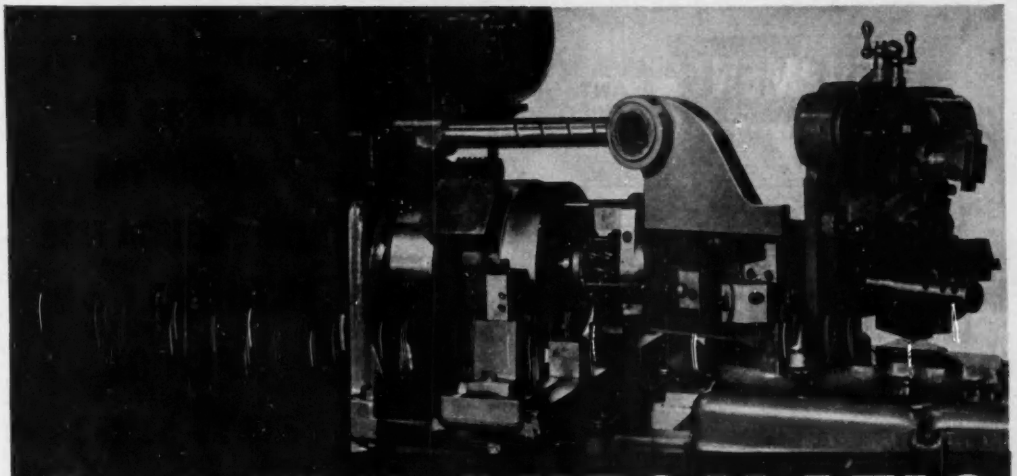
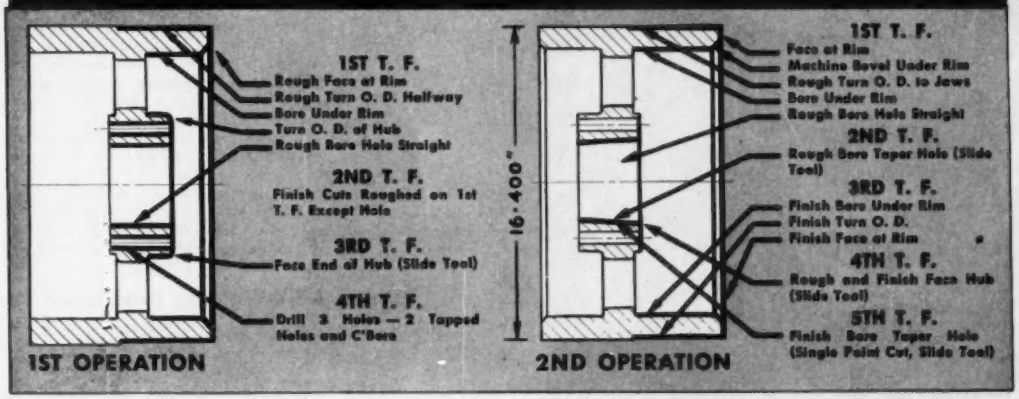


P&J 5DE AUTOMATIC


1ST T. F.
Rough Face at Rim
Rough Turn O. D. Halfway
Bore Under Rim
Turn O. D. of Hub
Rough Bore Hole Straight
2ND T. F.
Finish Cuts Roughed on 1st T. F. Except Hole
3RD T. F.
Face End of Hub (Slide Tool)
4TH T. F.
Drill 3 Holes — 2 Tapped Holes and C'Bore
1ST OPERATION
16.400"
1ST T. F.
Face at Rim
Machine Bevel Under Rim
Rough Turn O. D. to Jaws
Bore Under Rim
Rough Bore Hole Straight
2ND T. F.
Rough Bore Taper Hole (Slide Tool)
3RD T. F.
Finish Bore Under Rim
Finish Turn O. D.
Finish Face at Rim
4TH T. F.
Rough and Finish Face Hub (Slide Tool)
5TH T. F.
Finish Bore Taper Hole (Single Point Cut, Slide Tool)
2ND OPERATION

You should see it in operation — this typically efficient P&J high-speed method for machining Pulleys on a precision-production basis. The machine best fitted for the job is the P&J 5DE Power-Flex Automatic with its 17 inch swing over the cross-slide. The Tooling on its 5 turret faces and cross-slide consists mainly of P&J's *standard* turret tool units, augmented by P&J-designed slide tools for machining the hub ends and taper hole, and a P&J-designed multiple spindle drill head which is aligned automatically for the proper position of the 5 holes in the hub and which rotates with the work. The cycle of operations is fast and fully automatic . . . results in faster and better machining . . . to closer limits of accuracy . . . with fewer rejects . . . at a highly profitable rate of production.

MORE THAN
FIFTY YEARS' EXPERIENCE
DESIGNING PROFITABLE
PRODUCTION TOOLING
FOR P&J AUTOMATICS

POTTER & JOHNSTON Co.

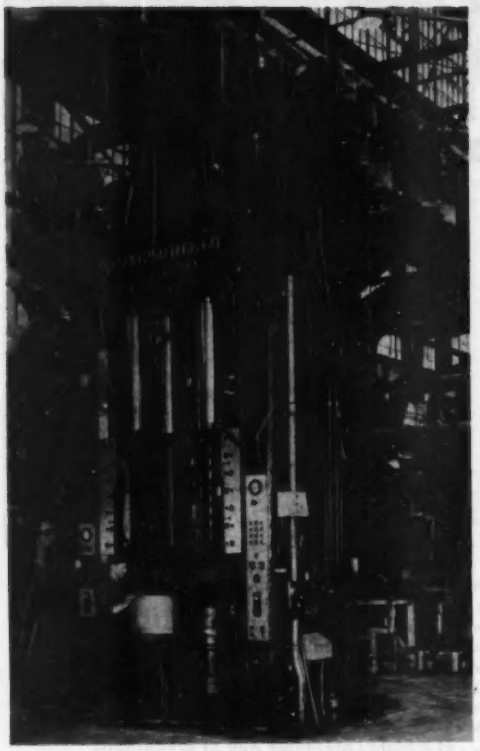
Precision Production Tooling for 53 years

P&J

For additional information regarding any of these items, please use coupon on page 62

(Continued from page 60)

A locking type selector switch simplifies changeover from single-action to double-action operation or vice versa. Another selector switch permits immediate or delayed ejection through a lockdown device. Indicating lights, built into the press, are connected to the motor starter.

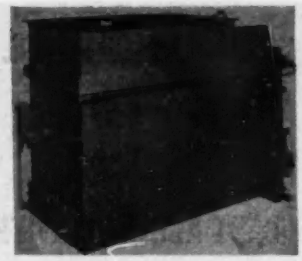


Bliss double-action hydraulic press.

J-3—Solvent-Vapor Degreaser

A completely redesigned and improved model of a Detrex hand-operated, solvent-vapor degreaser has been brought out by Detrex Corp., Detroit, Mich. The production cleaning machines included in this series, identified as VS-800, make use of non-flammable chlorinated hydrocarbon solvents, either trichlorethylene or perchlorethylene for the removal of oil and grease from all kinds of metal products. The usual cycle of operation is vapor cleaning, then flooding clean solvent over the work with a hand held spray lance, followed by the usual pure vapor cleaning phase which is characteristic of solvent-vapor degreasing.

A minimum of floor space, lower working height, and an efficient new style solvent condenser are some of the improvements featured. As the clean-solvent storage tank is built integral with the main machine body, the new design has made it possible for the inside work space to be cleared of all



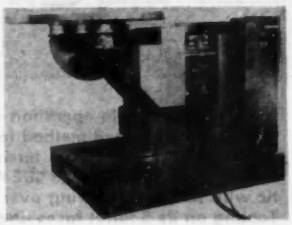
Detrex solvent-vapor degreaser.

projections, including the solvent collecting trough, condensing coils, and vapor level control bulb; thus providing unobstructed entrance for work being cleaned. Easy operation from either side of the machine is also made possible because of the relocation of the solvent storage space.

Further refinements include: simplified piping and water separator arrangement, large access door for easy cleaning of the solvent storage section, and a redesigned condenser coil that provides a greater volume of distillate for slushing. A standard heating-door opening is provided to accommodate the interchange of heating means, consisting of steam coils, gas burners or electric elements.

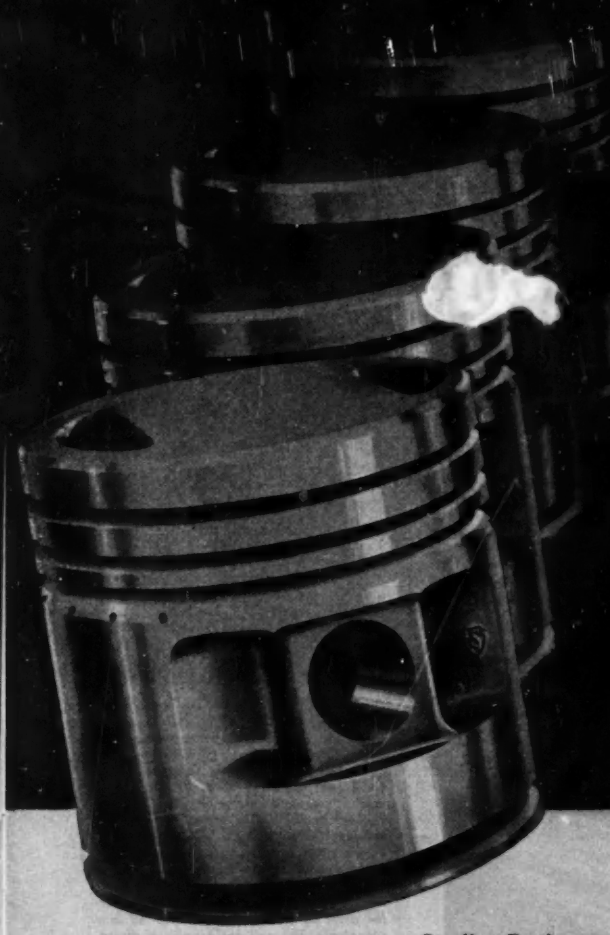
A new improved type of corrosion-resistant coating, called FF-1, is applied to all interior surfaces of the VS-800 model degreasers. In addition to 21 standard sizes in which this model is available, "specials" will be built to fit individual product requirements.

J-4—Welding Positioner



Model 21 precision automatic welding positioner, designed for automatic welding, is available from the manufacturer, Aronson Machine Co., Arcade, N. Y. The table rotates at any infinitely variable speed from zero to 2.7 rpm, and at 4 rpm constant speed for quick positioning. Precise table speeds are indicated on an electric generator tachometer. Speeds can be read as close as 0.025 rpm. The two hp motor provides forward or reverse rotation. Table tilt is accomplished through a three hp brake motor affording instant stopping. The table tilts 135 deg in 23.4 sec. Precision limit switches control the degree where the table will stop either tilt or flat. Entire body of the positioner raises 24 in. This is accomplished through a three hp brake motor. Guide rollers elevate on two columns through a rack and pinion. Precision limit switches control desired height both top and bottom between 24 in.

STERLING
PISTONS



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Sterling Engineers will work with you as they have with other leading manufacturers in developing pistons to meet your exacting requirements. Write or phone.

NEW PRODUCTS

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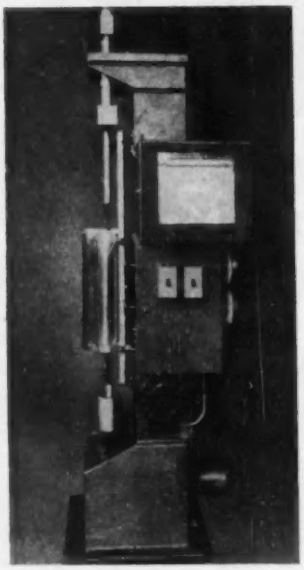
K-1—Bolt Extensometer

A bolt extensometer designed for tensional tests of bolts has been placed on the market by Baldwin-Lima-Hamilton Corp., Philadelphia, Pa. The instrument has been designed to contact the center of the ends of the bolt, making direct measurements of elongation. If the extensometer is left in position until actual fracture of the bolt, a complete load-elongation curve can be obtained, showing ultimate strength and over-all elongation.



Baldwin bolt extensometer.

The two arms of the extensometer are essentially parallel at the start of a test. Lower contact is a long thumbscrew on the end of the lower arm which is held in position by a spring. Upper contact is a hardened point in a yoke that straddles the upper loading frame and has two knife-edge stirrups that support a yoke on the upper extensometer arm. Vertical arms holding the knife edges are adjustable to cover a range of bolt lengths.

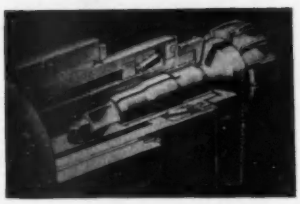
Specimen holders consist of hardened, tapered inserts fitted in box-like holding fixtures. The upper insert has a clearance hole for the bolt and the lower one is threaded. Retainer plates keep the inserts and bolts from jumping out at fracture. The extensometer is designed to operate with loading frames of 50,000 lb capacity which accommodate bolts up to ¾-in.

Of the Microformer type, it employs variable miniature transformers. In operation, changing deformation in the specimen actuates the movable core of the strain-follower Microformer, which changes its output and unbalances an electrical circuit that includes a similar Microformer in a recorder. The resulting electrical impulse is amplified to drive a servo motor, which moves the core of the recorder Microformer, thus rebalancing the electrical circuit, and moves the recording mechanism in proportion to specimen deformation. The extensometer has magnifications of 12.5, 25 and 50 to one.

K-2—Cutter Driving Device

A cutter driving device which makes possible the pre-setting of many types of tools is being put out by the Cross Co., Detroit, Mich.

Known as the Cross-Drive, the arrangement features quick changing, pre-set cutters, and a spindle drive which holds the cutter rigidly and precisely. The worn cutter is removed by sliding it out of the spindle after loosening a large lock nut. A new pre-set cutter is then inserted. Adjustments are made while the machine is running. Cutter length is pre-set to a dial indicator reading within 0.0005. A master length gage is supplied with the fixture to establish the limits on the indicator.

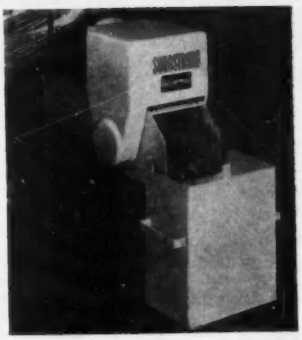


Cross cutter driving device.

The long, straight shank of the Cross-Drive is gripped by a four-point collet. A large square at the end of the shank makes the drive positive. An adjusting screw takes the thrust against the bottom of the hole in the spindle.

It is adaptable to a variety of cutters. Shank sizes have been standardized in diameters of 1½ in., 2 in. and 2½ in.

K-3—Coolant Separator



Designed for installation on many types of grinding, honing and gear shaving machines is a magnetic coolant separator being produced by the Sundstrand Magnetic Products Co., Div. Sundstrand Machine Tool Co., Rockford, Ill. This separator is completely automatic. It cleans the coolant as the liquid passes under a revolving drum of solid Alnico which is permanently charged. The coolant is directly exposed to the magnetic drum without interference from non-magnetic insulators. Separated material is removed from the drum by a scraper and deposited in a receptacle. This unit can be placed directly on top of the machine coolant tank. The overall length, including receptacle for separated material, is 28 in. Height, including receptacle, is 23 in. Width is 10¼ in.

K-4—Rubber Compound

Another rubber compound has been developed in the laboratories of the Acushnet Process Co., New Bedford,

(*Turn to page* 70, *please*)

FULL BORON EFFICIENCY with Grainal Alloys

Grainal is a more reliable means of making boron steels because the titanium, aluminum, zirconium and manganese in the alloy perform an important part of the treatment.

Grainal treatment is able to compensate for variations in oxygen and nitrogen contents of steel and for differences in finishing practice, thus effecting the proper treatment of steels by means of boron-containing alloys and providing constant benefit to properties.

Uniform results are obtained from one shop to another without the necessity of using identical steelmaking practices.

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MAKERS OF ALLOYS VANADIUM CHEMICALS AND METALS

NEW AIRCRAFT PRODUCTS

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T-1—Hydraulic Fluid

A hydraulic fluid of the water-base type, developed by R. M. Hollingshead Corp., Camden, N. J., and by Navy's BuAER and offered under the trade name H2 hydraulic fluid, has been approved by the Navy's Bureau of Aeronautics and is being used in Navy aircraft. It contains a minimum of 35 per cent water, with other materials to give it good lubricity and to make it serviceable at —60 F, overcoming the two serious disadvantages of water as a hydraulic fluid. It is nonflammable as liquid or vapor, has no flash point, is nontoxic, and has a pleasant odor. It is compatible with up to about 10 per cent petroleum-base fluids.

T-2—Plastic Tape

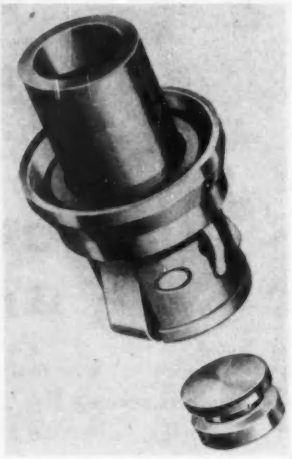
A transparent plastic film tape designed to prevent galvanic corrosion between aluminum and magnesium aircraft parts has been announced by Minnesota Mining and Manufacturing Co., St. Paul, Minn.

Developed upon the request of a leading military aircraft builder, the tape—"Scotch" brand plastic film tape No. 473—is especially adaptable for the separation of dissimilar metals in structural fabrication of aircraft, the manufacturer explained. In addition, it can be used for overcoating printed tapes used to identify fuel lines. The No. 473 tape is made in ½- to 30-in. widths, in a 36-yard roll.

T-3—Floor Fitting

A 40G, lightweight attachment fitting for seats, litters, etc., which is being specified for use with the standard AN 7516 stud on aircraft is being manufactured by Gordon D. Brown, Beverly Hills, Calif.

The Brown-Line fitting is close coupled and positively locks or unlocks by a sliding collar. The design of the fitting also permits removing or installing the seat in place with a vertical motion. In addition, the holding jaws remain in the open position when the fitting is unlocked so that the seat can be instantly located over or removed from the stud. As the bottom surface of the fitting is free of all protrusions no damage can result if the seat is dragged across a floor or other surface.



Brown attachment fitting for aircraft seats, etc.

T-4—Turbine Engine Starter

A line of turbine engine starters have been brought out by Hamilton Standard Div., United Aircraft Corp., East Hartford, Conn.

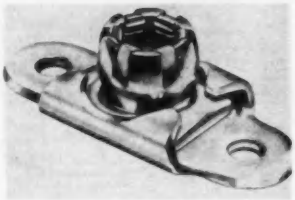
The starter, in production for the Air Force's jet bombers, is operated by compressed air from a ground source or a turbine engine. Air is passed through a turbine wheel which is connected through a gear train to a clutch. When operating at full power, the turbine, which turns up to approximately 45,000 rpm, delivers over 100 hp for driving the engine's own turbine. The start is accomplished in approximately 20 sec.

Once a single engine of the bomber has been started, it provides a source of compressed air to be fed through the starter of the next engine.

Hamilton jet starter.

T-5—Self-Locking Nut

A lightweight self-locking nut is now in production at Boots Aircraft Nut Corp., Stamford, Conn. Called H65 floating anchor Plate-Lok series, it conforms to specifications AN366 and AN362.



Boots self-locking nut.

This nut is similar to other Plate-Loks in that the nut is of one-piece, all-metal construction. However without any change in structure or function, elements of the design have been changed so as to considerably reduce the weight. The weight saving is approximately 33 per cent over previous types.

The Boots lightweight floating anchor Plate-Lok is applicable at temperature ranges of both 250 F and 550 F. It is being made available in sizes 8-32, 10-32 and ¼-28, in steel, aluminum and stainless steel baskets.

Tandem bearings made

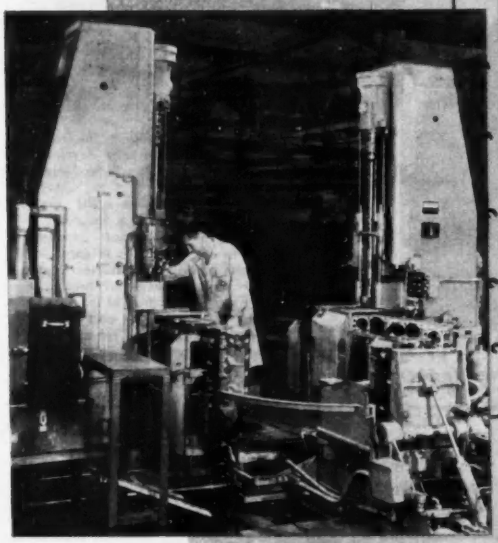
ROUND ★ STRAIGHT ★ IN LINE

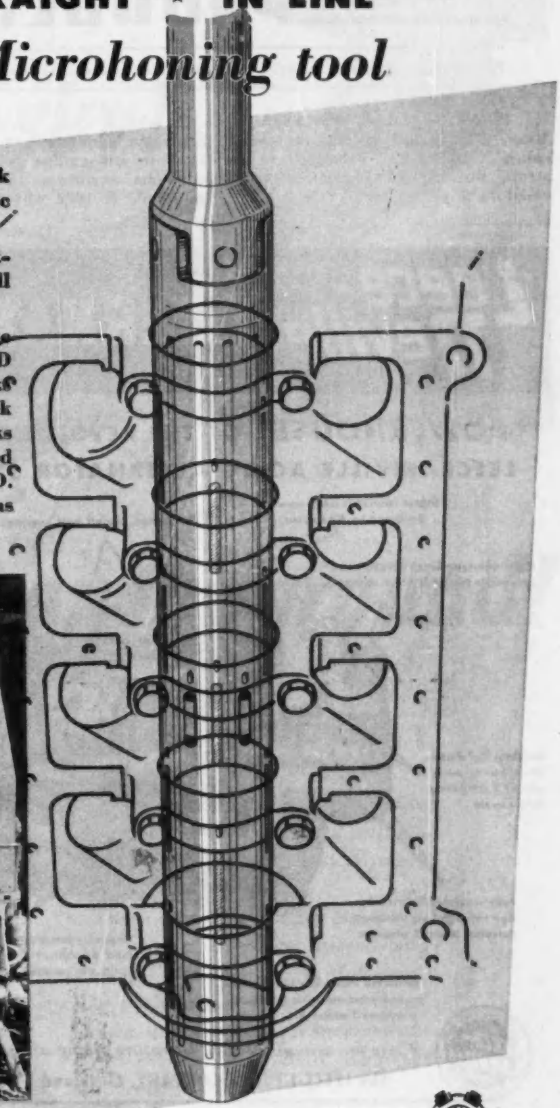
with NEW *Microhoning tool*

ALL FIVE bearings in V-8 cylinder block MICROHONED within .0005" for diametric size, roundness, straightness and alignment.

Plastic guides stabilize tool and control cutting. One bank of abrasives MICROHONE all bores.

This double column Model 740 machine equipped with new guided type MICROMOLD tools MICROHONES Main Bearings in 60 blocks per hour, removing approximately .002" stock from the diameter of each bearing. The blocks are automatically taken from the line, conveyed to either of the columns, and MICROHONED. The operator makes occasional spot checks as the blocks leave the machine.





Write for Cross Hatch for complete data on MICROHONING Interrupted Surfaces

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District Field Offices: 1323 S. Santa Fe Avenue, Los Angeles 21, California • 206 S. Main Street, Rockford, Illinois • 231 S. Pendleton Avenue, Pendleton, Indiana • MICRO-MOLD Manufacturing Division, Boston Post Road, Guilford, Connecticut • 55 George Street, Brantford, Ontario, Canada

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 62

(*Continued from page* 66)

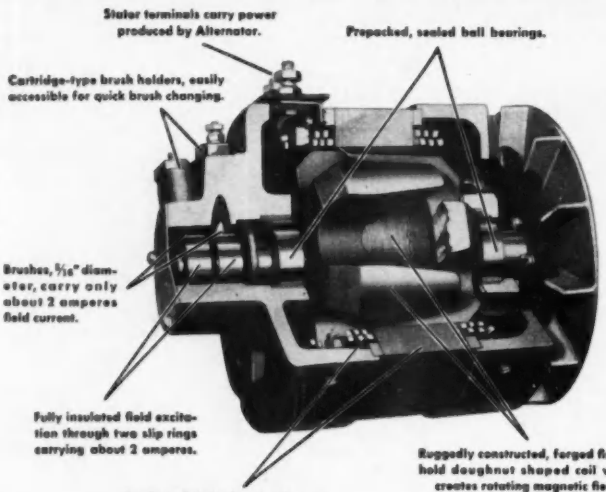
Mass. This latest special compound, called X 1692, was developed to restrain shrinkage and swelling in oil resistant applications.

X 1692, a Buna N compound of 70 Shore "A" durometer, has a minmum swell in low aniline point oil, and a minimum shrinkage in high analine point oil. X 1692 will not corrode or otherwise damage such metals as alumium, magnesium and other alloys or stainless steel, according to the firm.

The company is now producing packings, bushings, seals, couplings, etc., from this stock.

Leece-Neville ALTERNATOR

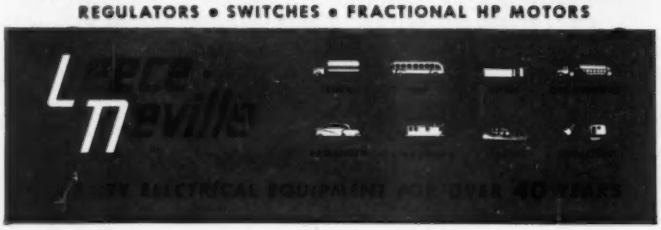
"POWERHOUSE" OF THE REVOLUTIONARY LEECE-NEVILLE AC-DC ALTERNATOR SYSTEM


Stator terminals carry power produced by Alternator.
Prepacked, sealed ball bearings.
Cartridge-type brush holders, easily accessible for quick brush changing.
Brushes, 5/16" diameter, carry only about 2 amperes field current.
Fully insulated field excitation through two slip rings carrying about 2 amperes.
Laminated stator has simple, preformed winding with few turns, produces 3-phase A.C. power.
Ruggedly constructed, forged fingers hold doughnut shaped coil which creates rotating magnetic field.

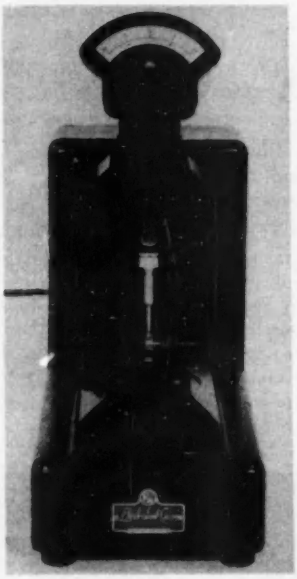
Write for new, illustrated literature giving all basic data.

The LEECE-NEVILLE COMPANY, Cleveland 14, Ohio

ALTERNATOR SYSTEMS • GENERATORS • CRANKING MOTORS
REGULATORS • SWITCHES • FRACTIONAL HP MOTORS



K-5—Radial Play Gage



A comparator for measuring the radial play of ball bearings has been developed by Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn., in cooperation with New Departure Div., General Motors Corp. Known as the Pratt & Whitney Electrolimit internal clearance comparator—lever type, it is intended for gaging small precision instrument-type bearings. With interchangeable tooling it will handle bearings from 3/32 in. bore to 1/2 in. bore. The principal part of this comparator is the C-shaped sub-assembly. The bottom of this assembly is fitted with an arbor that holds the bearing vertically and securely by its inner ring so that the outer ring is free to move according to the amount of radial play. An Electrolimit gage head is attached to the upper portion of the C-frame so that its diamond-tipped gaging spindle bears against the top of the outer bearing ring. This presses the outer ring to down position with all clearance at the bottom. At this point the first of two comparative readings is taken.

K-6—Signals

R. E. Dietz Co., Syracuse, N. Y., has recently introduced a new series of Class "A" Type 1 direction signal lights. Available in single face, double face and flush mounting models, they are designed to fit all signalling requirements of the heavy duty field. They feature Dietz Lucite plastic lenses.

This entire series of lights is of

(*Turn to page* 72 *please*)

Wings in the sky!

Wheels on the ground!

. . . FOR PEACE WITH SECURITY!

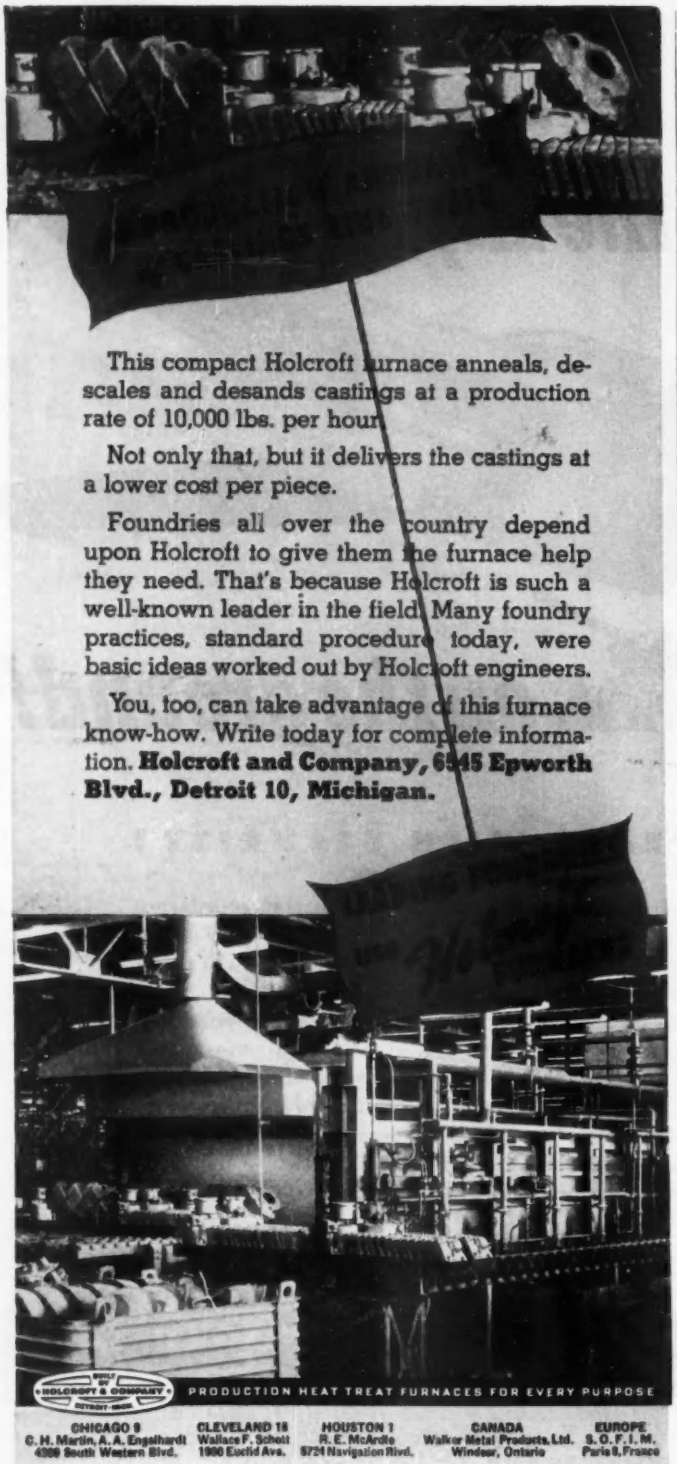
Long, long, long before the planes soar or the caissons roll . . . quiet, thoughtful men begin their patient research, study, planning, designing . . . to produce at last the myriad precision parts, assemblies and products needed by the aircraft and ordnance industries.

Today ninety per cent of our defense work . . . in research, design, engineering development and production . . . is on aircraft or ordnance contracts, for one part or a million, to be made with the utmost of painstaking precision.

These parts, assemblies and products . . . most often unseen and unsung . . . are the secrets of dependable performance of many weapons. Hence, they very greatly increase our positive power to defend the peace and security of America.

THE STEEL PRODUCTS ENGINEERING CO.

engineers and manufacturers
Springfield, Ohio


This compact Holcroft furnace anneals, descales and desands castings at a production rate of 10,000 lbs. per hour.
Not only that, but it delivers the castings at a lower cost per piece.
Foundries all over the country depend upon Holcroft to give them the furnace help they need. That's because Holcroft is such a well-known leader in the field. Many foundry practices, standard procedure today, were basic ideas worked out by Holcroft engineers.
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NEW PRODUCTS

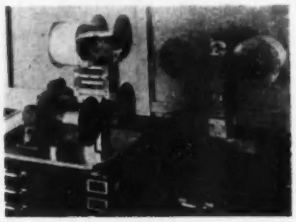
For additional information please use coupon on page 62

(*Continued from page* 70)

sturdy construction for long service. Single and double face models are two stud mounting, and have thick rubber waterproof mounting pads which cushion the lights. These Dietz Lights have been fully tested by Electrical Testing Laboratories. They exceed all I.C.C. and latest SAE specifications, and are approved for use in every State requiring approvals.

K-7—Robot Machinist

A robot machinist has been developed by Daco Machine and Tool Co., Brooklyn, N. Y., which will operate a machine tool by remote control. For mass production plants having long repetitive



Daco robot machinist.

runs of metal-cutting operations, the robot has wide application in all types of defense production, according to Daco engineers.

The parts that make up the Daco-built device are a paper-tape perforator, a sensor that translates the tape mes-

(*Turn to page* 74, *please*)

Machinery News

(*Continued from page* 60)

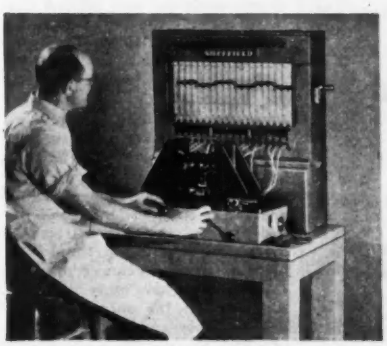
tion will handle all of the export business and direct the subsidiary plant operations of the two corporations located in Australia, Canada, England, France, Germany, Italy, and South Africa.

Division Transferred

The Charles H. Besly & Co., Chicago, manufacturer of grinders and taps, has announced that its industrial supply division will be transferred to the Barrett-Christie Co., also of Chicago. This move follows Besly's decision to concentrate on its manufactured products.

Checking bore diameters at 18 points.

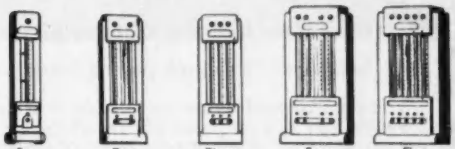
Checking 27 crankshaft measurements.



Checking contour
of a turbine blade at 18 points.

Each individual measurement is indicated by the position of a float in its respective Precisionaire column.

The float positions form a characteristic pattern similar to a graph. It's actually a quality control chart. The inspector sees at one quick glance whether the work part can be passed or should be rejected, and for what dimensions. No eye strain, no close concentration, no figures to remember, no confusion of multiple dial faces with the "Airechart."



Standard Precisionaire column instruments are made with one, two, three, four or five columns. Special Precisionaires can be built to include from 6 to 30 or more columns depending on the number of dimensions to be checked.

For complete details on simultaneous multiple measurements with the Precisionaire, call your local Sheffield representative, send prints to us or write for Bulletin CTP-491.

the *Sheffield* corporation

DAYTON 1, OHIO, U. S. A.

NEW PRODUCTS

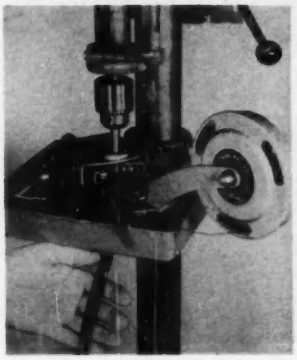
For additional information regarding any of these items, please use coupon on page 62

(*Continued from page 72*)

sage into electrical impulses that actuate selsyn motors. Perforations in the tape represent essential dimensions shown on the blueprint for the part to be machined. When the tape travels through the sensor, electrical contacts are made and broken through the holes to complete and break electrical circuits. This produces varying voltages in the sensor that control movement of the cutting tool and work piece in the machine.

Brains of the Daco-built device are in the tape. It can be punched out by a draftsman who makes computations from a blueprint. In effect, he places the part drawing over a grid like graph paper. Holes in the tape represent points and surfaces on the part.

K-8—Spring Winder



The Spring-Master, a spring manufacturing tool that can be applied to any drill press with a ½ in. chuck or larger, is now available from the manufacturer, DoALL Co., Des Plaines, Ill. A variety of extension and compression springs can be produced. It is possible to wind wire diameters from 0.020 in. to 0.071 in. and outside diameter of finished springs can be made to vary from 3/1€ in. to ⅝ in. Pitch of a compression spring may be infinitely varied while the machine is running. The built-in adjustable wire guide for use in the manufacture of extension springs provides for increase in the tension of the wire to the degree required to give the completed spring the maximum efficiency in operation.

K-9—Creep Recorders

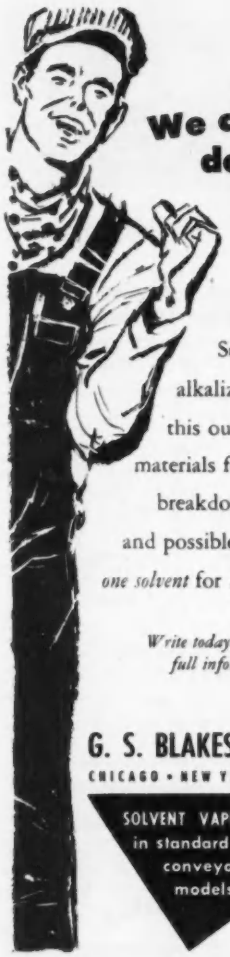
Two recorders for Baldwin lever-type creep machines and 4000-lb creep-relaxation testing machine have been announced by Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.

Creep specimen deformation of 0.020 in. produces full scale pen carriage movement of 10 in. across a strip chart. The chart is driven at ¼ in. per hr by a synchronous motor. A 150-ft chart roll gives a 7200-hr record.

Creep is amplified and transmitted from the extensometer by a Selsyn motor system, the pen carriage being driven by servo motor through a flexible shaft and a gear reducer. Eighty turns of the cable move the pen 10 in. A pulley on the output shaft of the gear box drives a counterweighted cord to which the pen carriage is attached. This drive pulley is operated through a slip clutch which permits zero adjustment of the pen.

For creep-relaxation records a conventional Microformer type strip chart

(*Turn to page 76, please*)



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Highest Stabilized Degreasing Solvent—BLACOSOLV is stabilized not alkalized—Years of research have produced this outstanding solvent. Contains no alkaline materials for the purpose of neutralizing acid *after* breakdown. Stabilizers prevent breakdown and possible acid formation. Blacosolv is the *one solvent* for *all metals* or *combination* of metals.

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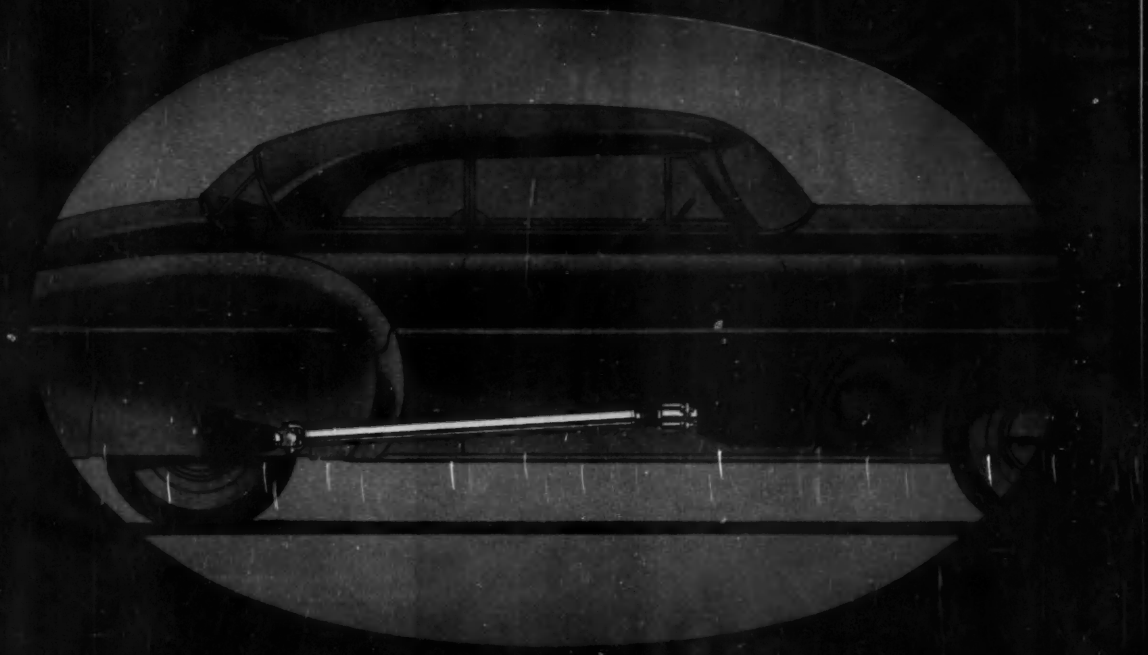
Car Operation Depends on the Drive Train . . .



. . . and the Drive Train Depends on the Universal Joints

No car can operate at its best unless the drive train is functioning efficiently. And satisfactory performance of the entire drive train depends upon the universal joints. "DETROIT" Universal Joints have kept pace with car design . . . are built to take the extra loads placed upon them by today's high compression engines.

Result: "Detroit's" smoother operating Joints Produce Smoother Rides.

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EVERY TIME
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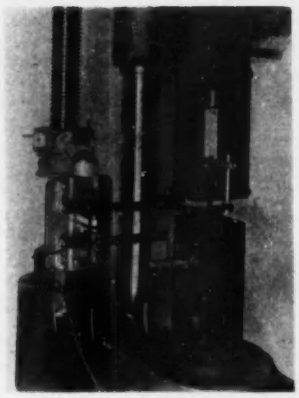
THE STANDARD TUBE CO.
Detroit 28, Michigan
Welded Tubing
Fabricated Parts
CARBON STEEL TUBING
½" O.D. to 5½" O.D.
.028 to .260 wall
STAINLESS STEEL TUBING
⅜" O.D. to 3" O.D.
.028 to .095 wall

NEW PRODUCTS

For additional information please use coupon on page 62

(*Continued from page* 74)



Baldwin creep recorders.

recorder has been developed. The lowering of stress in a specimen, maintained at constant tensional strain at any temperature up to 1800 F, is recorded by a conventional Microformer type servo system operated as an extensometer on a spring block loading device through which constant strain is maintained.

The receiving Microformer moves the pen across a 10-in. wide strip chart in proportion to the tensional load on the specimen. The strip chart drive is the same as for the creep machine. The two recorders have the same external appearance.

K-10— Die Cast Rivets

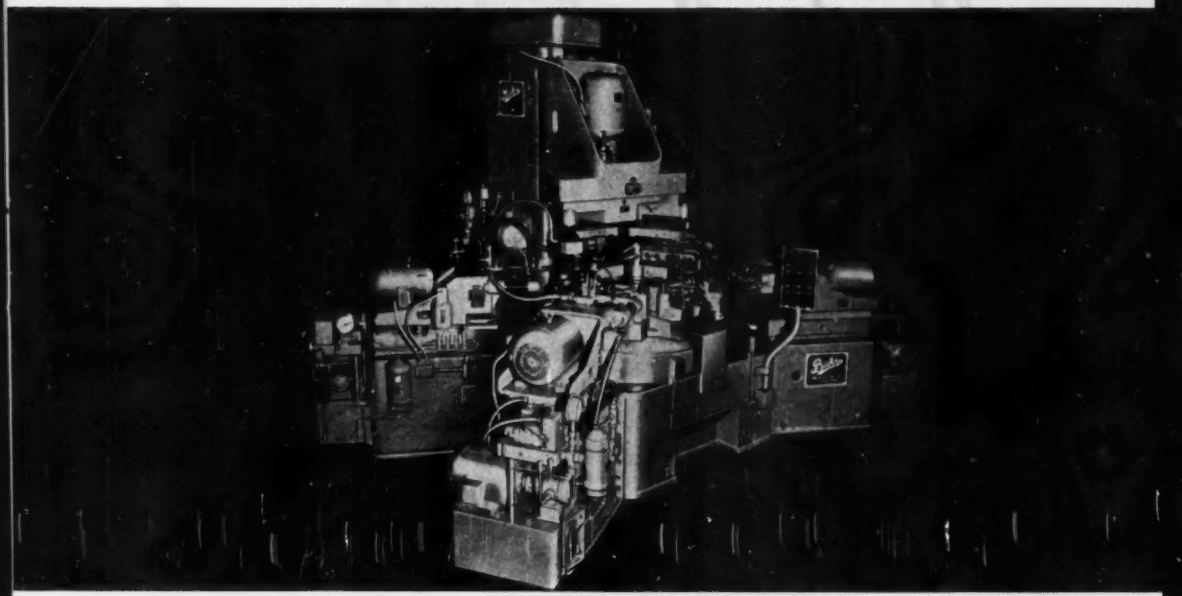
Die casting techniques of the Gries Reproducer Corp., New York, N. Y., have made possible a line of very small zinc alloy tubular and semi-tubular rivets. These GRC rivets offer the rust-proof, corrosion-resistant advantages of zinc alloy construction.

A tensile strength of 45,000 psi assures sufficient strength for low-stress applications not requiring the use of steel or brass. They are suitable for both machine and hand applications.

Standard sizes available for prompt delivery include diameters from 1/16 in. to 9/64 in. and lengths up to ⅜ in. with oval or flat counter-sunk heads. Special very tiny sizes as well as ornamented head designs and extra large head diameters can be produced. The rivets are supplied in plain bright and assorted commercial finishes.

(*Turn to page* 80, *please*)

WHY DOAKES GETS FROM BANFF TO TALLAHASSEE



What are the travel and automobile agencies reporting every season? . . . That Joe Doakes—the typical American—is taking more vacation and traveling farther year after year . . . And here's one of the reasons why—this Buhr Five-Way Horizontal-and-Vertical Hydraulic-Feed Drilling Machine . . . the Machine which one of the world's leading Auto Makers uses "around the clock" for producing Rocker Arms in such volume and at such low cost that . . . Joe Doakes may afford to drive thousands of miles for vacations—literally from Banff in west Canada to Tallahassee, Fla.

Auto Maker Chooses This to Turn Out 880 Pieces an Hour for Utmost Economy

As each new model comes off the auto assembly lines, the battle to cut production costs becomes more intense. Not long ago, one of the big auto companies concentrated on how to make a certain rocker arm most economically.

Here Was Their Problem

To secure a piece of production equipment which would perform 7 operations on the rocker arm, including tapping, drilling, endmilling, chamfering and spotfacing—that was the problem.

As the company to design and manufacture the Special Machinery to solve this problem, they chose Buhr.

What the Machine Does

In general—it drills 8 holes, drills through 4 more holes, taps 4 holes, endmills 4 places, spotfaces 4 places and chamfers 4 previously drilled holes. It is equipped with 42" automatic Index Table and six-station Holding Fixture, loading four parts per station. Parts are automatically clamped while fixture moves from loading position into first working station, and are automatically unclamped while Fixture moves from last working station to unloading.

Specifically, the Machine does this—

Station 1—Load and Unload

Station 2—Vertical, idles; Horizontal, taps and drills (4) 7/16-20 holes

Station 3—Vertical, endmills (4) 1/2" Radius places; Horizontal, chamfers (4) previously drilled holes

Station 4—Vertical, drills (4) 1/8" dia. holes 3/16" deep; Horizontal, idles

Station 5—Vertical, drills (4) 25/64" dia. holes through; Horizontal, spotfaces (4) 15/16" dia. places

Station 6—Vertical, idles; Horizontal, taps (4) 7/16-20" S.A.E. holes

PRODUCTION—880 pieces per hour at 100% efficiency.

Why Buhr Was Called In

Leading Automobile Manufacturers have done business with Buhr for more than a quarter-century. . . . They know Buhr's record for dependable Special Machinery . . . and for delivering on time. . . . They're familiar also with Buhr's excellent manufacturing facilities . . . and their experienced, trustworthy and specialized sales and engineering staffs. Consequently . . . for Special Machinery like this . . . it is second-nature for them to call Buhr.

For Details About Buhr

A comprehensive Catalog . . . or a personal call from a Buhr Sales Engineer . . . is yours for the asking wherever you are located in the United States! . . . For every problem involving this type of Special Machinery—including the type which helps Joe Doakes get from Banff to Tallahassee—phone, wire or write us.

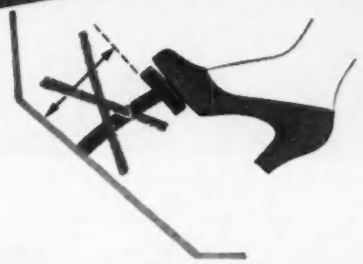
BUHR MACHINE TOOL CO.
Ann Arbor, Michigan
Phone: Ann Arbor 2-5646—5980
Detroit WOodward 3-2126

Buhr ***SPECIAL MACHINERY . . . Leaders Make Sure with BUHR***

Bendix Products Presents

TREADLE-VAC

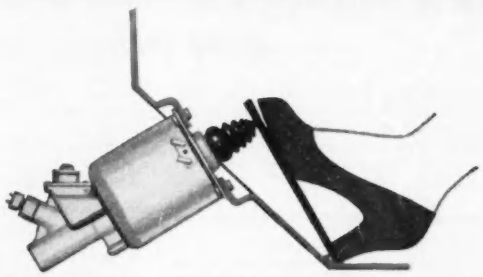
A REVOLUTIONARY ADVANCE



The old fashioned, long travel, high brake pedal requiring a lifted foot and leg power pressure can now disappear from the floor boards of modern cars.

Now passenger car manufacturers can offer braking that is comparable to the accelerator in operating ease, convenience and fatigue-saving comfort for the driver. Treadle-Vac gives an entirely new type of passenger car brake control, using the proved operating principles of the Bendix*Hydrovac,* the world's most widely used power brake. An easy ankle movement, much like working the accelerator, is all the physical force needed for normal braking. And what is equally important, the brake treadle can be on about the same level as the accelerator, so that the foot moves from one control to the other by simply pivoting on the heel. Thoroughly proved by years of testing, this latest development of Bendix engineers gives car manufacturers an opportunity to offer their customers *for the first time* the easiest, safest, and smoothest braking that can be imagined. From the standpoint of both appearance and performance, it is one of the finest new selling features available in years. Get the detailed story of this greatest advance in passenger car control since four-wheel brakes.

*REG. U. S. PAT. OFF.

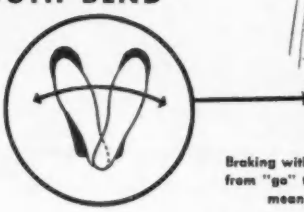


With Treadle-Vac the heel never needs to leave the floor. The low pedal, short travel and toe touch action mean that the swing from accelerator to brake can be made merely by pivoting on the heel.

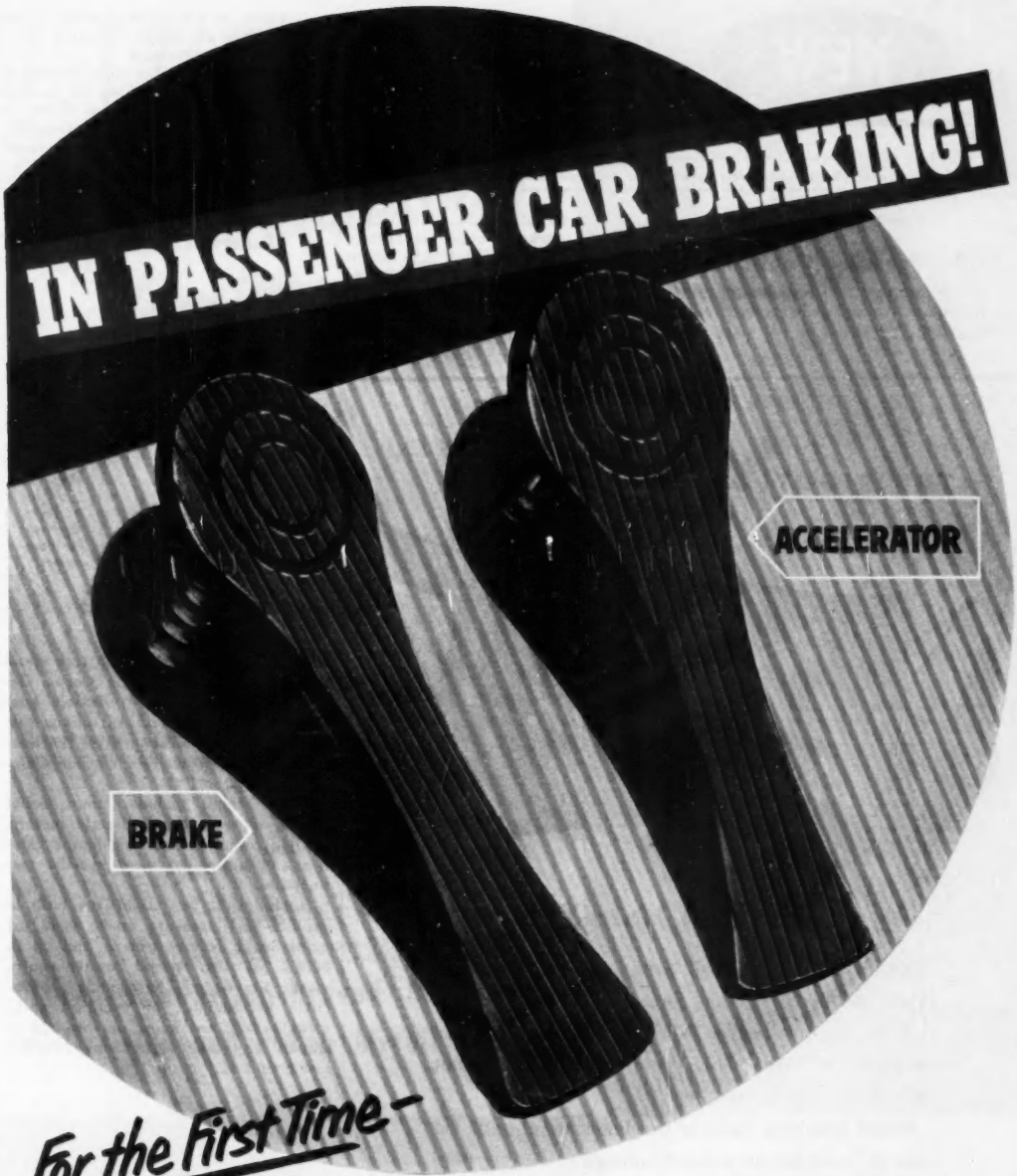
BENDIX · PRODUCTS DIVISION · **SOUTH BEND**

Bendix AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Ave., New York 11, N.Y. • Canadian Sales: Bendix-Eclipse of Canada, Ltd., Windsor, Ontario, Canada



Braking with Treadle-Vac is not only easier, but it is faster as well. Shifts from "go" to "stop" control are made in one fourth less time. This can mean five feet shorter stopping distance at 60 miles per hour.



—A Low, Light-pressure Brake pedal

Comparable to the

Accelerator in Operating Ease!

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 62

(*Continued from page 76*)

K-11—Pressure Control

For regulating control valves, a compact non-indicating pressure controller has been developed by Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. To be marketed under the name of Honeywell Pressure Pilot, it is for use on process systems where pressure control is essential. The pilot employs a bourdon tube to measure the pressure and a flapper and nozzle arrangement to produce an air signal directly to the valve. This air signal is based on a change in line pressure.

New features of the pilot include a set-point adjustment. Also, the control action may be changed from direct to reverse, and the mechanism is protected from damage by a unique overload spring arrangement.

K-12—Overhead Lubricator

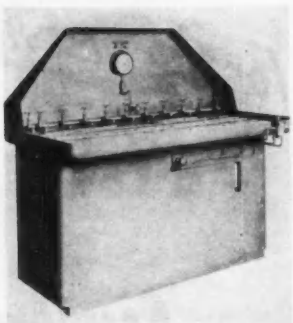
This automatic overhead lubricator, the Vapor Master, has been placed on the market by United States Aviex Co., Niles, Mich. To convey lubricant to the upper cylinder region, it can be used for gasoline, propane and butane fuel engines.

K-13—Hydraulic-Test Stands

Illustrated is a hydraulic test stand designed by Superdraulic Corp., Detroit, Mich., for testing flexible hose used in aircraft. With variations this same stand can be adapted to the testing of valves, cylinders and other equipment.

These stands include pumps, relief valves, oil reservoirs, electric motors, flexible couplings and incidental valving and piping to meet specific test purposes.

Superdraulic test stands are built to provide test pressure up to 5000 psi using large volume pumps and up to 30,000 psi with special booster equipment. Stands can be modified to include accumulator or cycling equipment as well as timing devices and to employ any type of hydraulic oil for test purposes.



Superdraulic test stand.

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Not only in precision ball bearings, but in countless other places, Strom has found that the right ball will do the job better. Maybe your problem can be solved with the use of the proper ball. Why not take it up with Strom.

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Compressor blade for turbojet aircraft engine.

XLO

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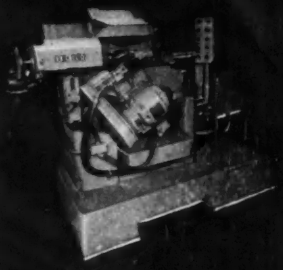

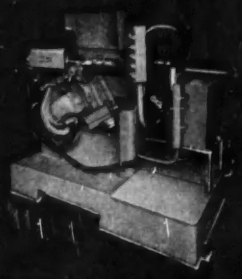

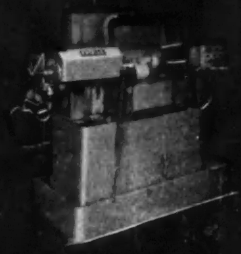

Three Production-Proved Machines Mill, Grind and Polish Airfoil Forms

The complex job of finishing the airfoil form of compressor blades for jet aircraft engines is now done speedily, accurately, and automatically by three Ex-Cell-O standard machines. Production-proved, these machines mill, grind, and polish, respectively, with completely automatic machining cycles. Operator merely loads, unloads, and pushes start button. For further information and specifications contact Ex-Cell-O in Detroit today.

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O & S BEARINGS
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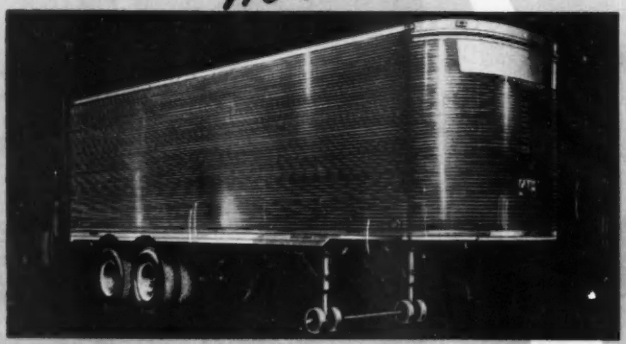
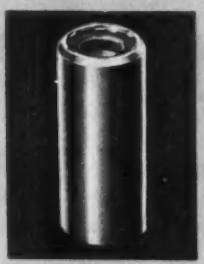
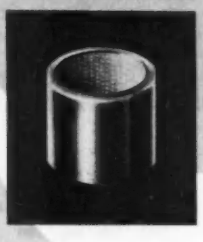
. . . . . are Typical
of the Original Equipment
that Makes

FRUEHAUF *GREAT*
from the Ground Up!





To many the two O & S Bearings shown here will appear relatively unimportant in so huge a thing as a trailer. To Fruehauf engineers — these bearings, as every other part or piece of material, are tremendously important. That's why Fruehauf is "great from the ground up."



O & S bearings are produced by a company with 38 years of manufacturing skill and engineering experience. O & S non-metallic, self lubricating bearings are designed for a definite job . . . built to do that job — better — longer and more economically.

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OR SEND PRINTS AND DETAILS

Our 38th Year Manufacturing Original Equipment

NeverOil SINCE 1913
O & S BEARING CO.
303 SOUTH LIVERNOIS • DETROIT 17, MICHIGAN

Willys-Overland Passenger Cars

(*Continued from page 41*)

The rear suspension consists of semi-elliptic springs, two-in. wide, 48-in. long of tip insert type, with seven leaves, and special inter-leaf inserts to control frictional characteristics. Springs on the Super Deluxe and Custom models are mounted at their front end on a floating cross-member which is attached to the frame by means of shear type rubber mounts. Front eye and rear shackle bearings are rubber-insulated, the rear shackle hanger also being rubber insulated at the frame. The rear shackle is of compression type. No sway bar or stabilizer is required.

Rear springs are so mounted as to have a three-deg negative rake at the front and a 6½-deg toe in at the front. These features are intended to provide handling stability.

Shock absorbers are of direct-acting, Monroe full displacement type, with two-way control. They are rubber mounted, with the loop at the bottom, stem at the top for front shock absorbers. Rear shock absorbers are mounted ahead of the axle and are toed in at the top. Stone and dust shields are applied only on rear shock absorbers.

The front cross-member to which the engine is mounted is of detachable A-frame form and is readily removable to facilitate maintenance. With this feature it is possible to remove the engine either from the top or bottom, as convenient.

Standard tire equipment is the 5.90-15 black tire. However, the design permits the installation of 6.40-15 optional tires. Wheels are 15-5.40 drop center type with four bolt mountings.

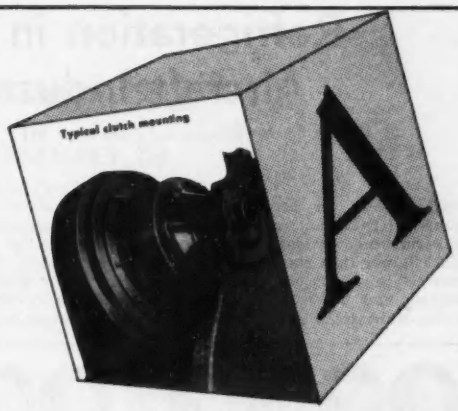
As mentioned earlier the new body is of "unitized" type with chassis framing built in as a part of the body structure. Two box-shaped frame members along the sides, running from front to the rear constitute the major framing members. Engine cross-members, radiator supports, and rear spring hangers on Super Deluxe and Custom models are detachable.

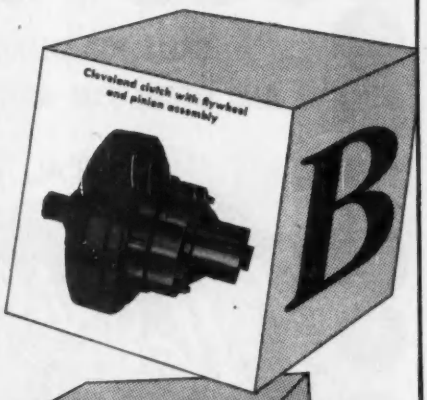
The windshield is of two-piece curved glass type with a central division bar. The rear window is 53¼ in. long on Deluxe and Super Deluxe models; and of wrap-around type on the Custom.

The Customaire heater, of full fresh air type with thermostatic control, is mounted under the hood with a distribution chamber and blower located under the cowl.

AUTOMOTIVE INDUSTRIES
Keeps You Informed

Simple as





Design simplicity of the Cleveland Drum Type Friction Clutch and Brake assures *foolproof operation, minimum maintenance* and *easy adjustment.* You are assured of exact control of the slide during all phases of operation. Clutch and Brake cannot engage simultaneously . . . always full clutch *or* full brake. Patented drum type design gives quicker starts and stops. If electric or air supply fails, positive spring loaded brake stops slide immediately.

Foolproof design and lightweight construction reduces horespower required for clutch operation. Long friction life is assured as all idle friction surfaces are completely disengaged eliminating drag, unnecessary wear and destructive heat. Clutch and brake adjustments are easily made without removing unit from press. Minimum number of moving parts makes clutch operation and maintenance simple as ABC.

Be sure to investigate the opportunities for increased production at lower unit costs offered by Cleveland Drum Type Friction Clutches. They can be installed on most Cleveland Presses new or old. Complete information will be forwarded upon request.

A-4786

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Established 1880

POWER PRESSES

CLEVELAND 14, OHIO

Refrigeration in the Aircraft Industry

(*Continued from page* 53)

refrigeration. In the Douglas El Segundo aircraft plant are immense boxes in permanent locations, as well as boxes much larger than ever seen in a home, moving in trains or banked around presses and other fabrication equipment. Many small and large refrigerators on wheels are used in the plant.

The primary use of the boxes is to retain the "as quench" conditions after heat treatment of aluminum alloys. Parts are placed in very large boxes adjacent to the heat treating ovens, then dispatched by portable box to the fabrication operations, such as hammers, punch presses, stretch presses, mills, etc. Operators remove the parts to perform forming or machining operations and then replace them in the boxes. When the orders are completed they are returned to the heat treating department to age.

The refrigerators have proven very efficient and have replaced the use of "dry ice" for these purposes. The El Segundo Division Plant engineering department designed these boxes, as well as conveniently placed electrical outlets throughout the plant.

The great advantage to forming and machining parts in this condition is the reduction of hand work with the soft material. Forming and machining in the "T" condition has been found in many cases to cause warpage and distortion, which is extremely expensive to correct. It also requires more expensive tooling in many instances.

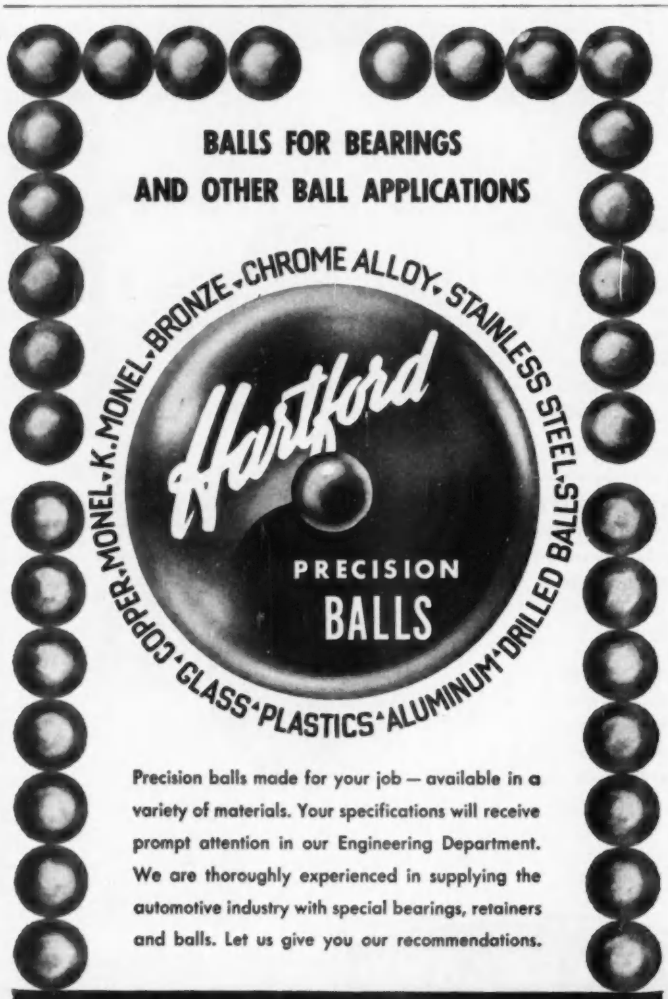
In addition to this primary usage, there are a multitude of others in the plant. An interesting adaptation is the use of small boxes in the machine shop. These boxes are used for freezing rubber and soft plastic parts for drilling close tolerance holes. These parts are very difficult to drill at room temperatures, but by holding to extreme cold temperatures drilling is simplified.

Another popular usage is in precision assemblies where liners, bushings, or close tolerance fits are required. In these instances small boxes are used to contract by extreme cold the liner, bolt, or bushing. The mating part is expanded by heat, making hand fits very easy, where soft metals would gall or score, or remove protective plating if drive or interference fits were made. Alternate methods such as locking, staking, etc., are usually less economical.

Modern aircraft and materials present many problems unknown a few years ago in the industry. A refrigeration usage recently adopted is for a caulking or sealing compound for all exterior and interior skin or structure laps subject to fumes or moisture entering compartments where pilots or crew must be. The compound found most desirable is one which must be kept at a very low temperature, and here small boxes conveniently located at point of usage are found to be most advantageous.

Another important application is in the processing of high carbon race steel, used in some machined parts. Here it is very desirable to reduce checks and cracks in the heat-treating processing of this material. It has been found that an extreme cold quench after oil quench, and again after cadmium plate bake, materially reduces cracking.

These are only a few of the interesting applications of electrical refrigeration in the El Segundo plant, but the ultimate uses may be manifold with new materials that are being developed to meet the requirements of the fast-developing aircraft industry.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Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.
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Bodine CASE HISTORY NO. 32

...AN AUTOMATIC ASSEMBLY OF STUD, SPRING AND SLEEVE

PRODUCTION: This Bodine No. 40-10 Dial Type automatic assembly machine produces 1500 completed parts per 50 minute hour at 30 strokes per minute. One operator can attend several machines. Top view shows tooling with 3 Syntron type hoppers to feed stud, spring and sleeve. Tolerance held to overall height of ±.008. Our engineers provide an overall service to solve your specific problems with Bodine automatics and tooling for drilling, milling, tapping, screw insertion and assembly.

You can't meet Tomorrow's Competition with Yesterday's Machine Tools

THE **Bodine** CORPORATION
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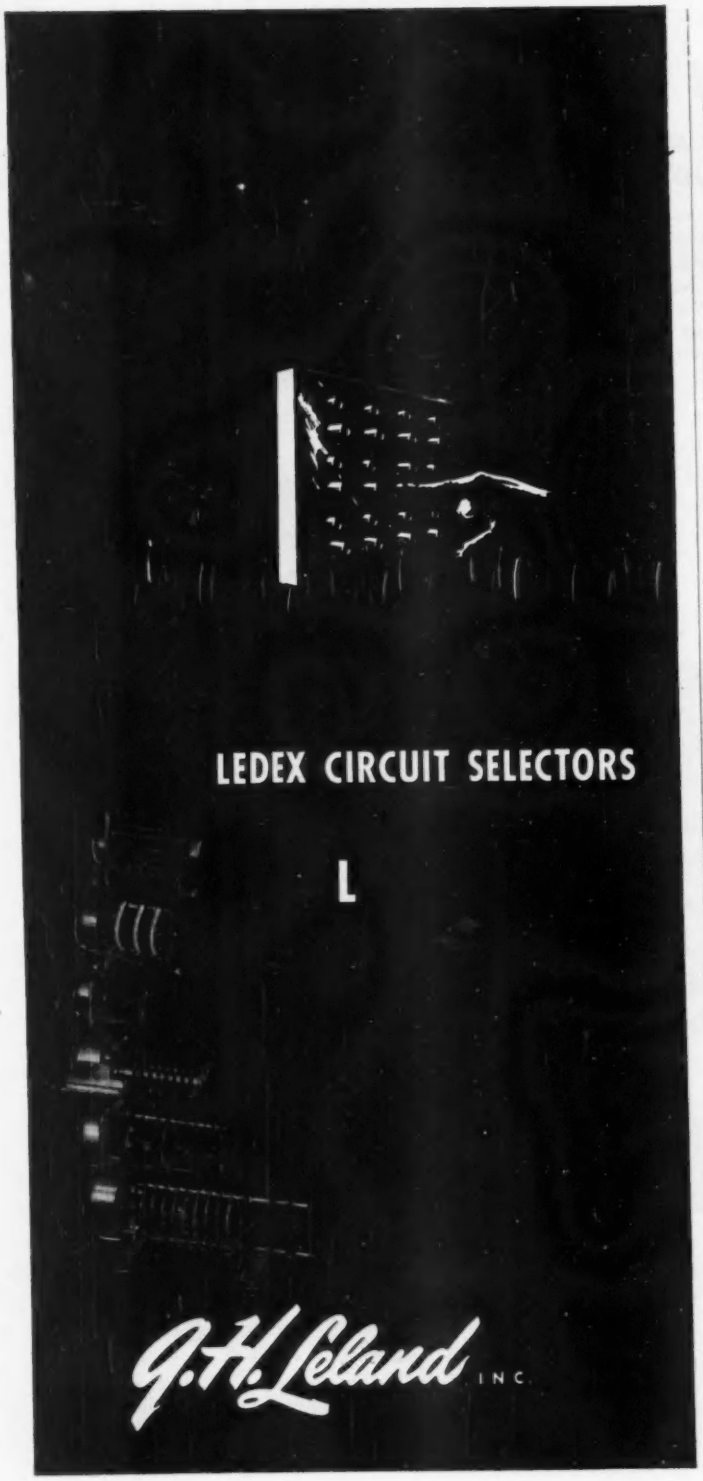
AUTOMATIC DIAL TYPE DRILLING, MILLING TAPPING, AND SCREW INSERTING MACHINES

19052



Bazooka Rockets

(*Continued from page* 35)

both sides, the one on the left for screwing in the part for testing, the one on the right unscrewing it for ejection. Motor closures are proof tested at a pressure of 18,000 psi.

It may be noted that in addition to Ford quality control at each of the final inspections on major parts, the parts are given a sampling inspection by the customer — Ordnance — before they are accepted for assembly.

At this point the motor body is fitted with the tail assembly and is ready for painting. Painting is done in two stages in DeVilbiss water-back spray booths with the motor bodies mounted vertically on spindles on a conveyor. First operation is the application of a prime coat on the tail assembly, then, as the work enters the second booth, the entire assembly is given the standard paint coating. In the paint section the work continues on the conveyor and is transported through a small infra-red lamp oven for drying the finish.

The head assembly, a bomb-shaped element which serves as the envelope for the rocket mechanism, consists of two major sections—the head casting of gray iron, made in the Ford foundry, and the formed steel ogive. The casting is finished on the outside in a succession of machining stages in a large battery of Bullard Mult-Au-Matics. After inspection, the cavities of both the head and ogive are given a protective paint spray. Then the ogive is pressed onto the body and staked in place by means of a die in a small press.

The entire assembly then is sprayed with the standard finish in another battery of DeVilbiss spray booths and dried in an infra-red lamp oven. This unit is completely conveyorized.

Vibration Testing

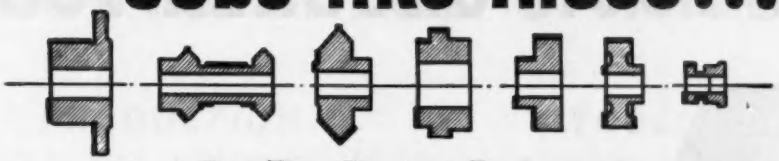
(*Continued from page* 32)

Since this arrangement allowed the body to leave the table vertically, many different cycles were induced, including a weaving and rolling motion accompanied by shock of the bounce. During the weaving and rolling motion, one side of the body left the table several inches for a fraction of a second. The process was then reversed.

At the start of the run with the body repositioned, the vibration machine was run at 375 cycles. The test was stopped when the severity of the vibration at this speed threatened to throw the body off the table.

The speed of the machine was reduced to 290 cycles and after an interval all Speed Nuts torqued the same as at the start of the test with a few nuts actually gaining in torque.

Jobs like these...



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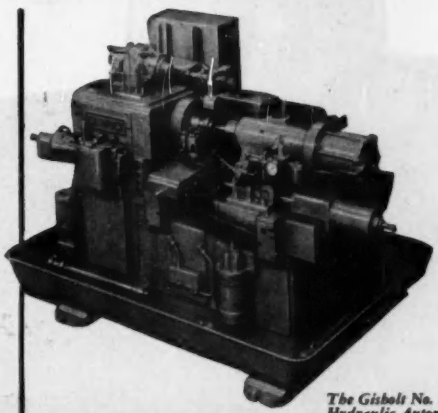
on Automatic Lathes?

Absolutely! And these are only 8 of over 200 actual small-lot jobs handled on Gisholt No. 12 Hydraulic Automatic Lathes. The Crompton and Knowles Loom Works of Worcester, Mass., has *four* No. 12 Hydraulics busy producing and saving on work like this . . . and all with standard tool blocks!

Job-lot work like this—and like yours—is a natural for the No. 12 Automatic. The cost is no more than a hand-operated lathe for work this size . . . yet you have the added advantages of automatic machining and one-man operation of two or more machines.

If you have contract work like this, now or pending, it will pay you well to get the facts on the No. 12 Hydraulic Automatic Lathe. There's a big 24-page catalog free for the asking.



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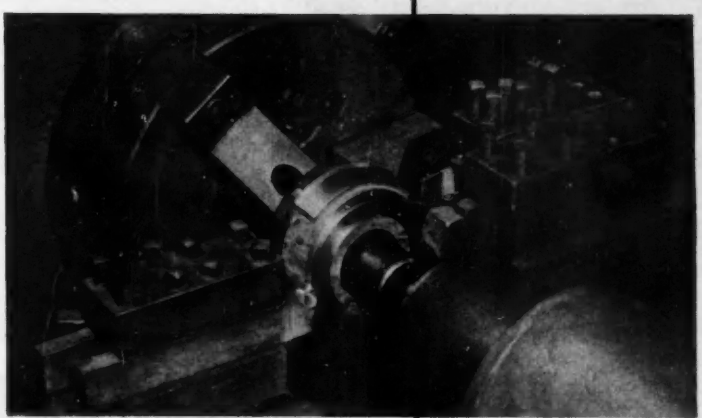

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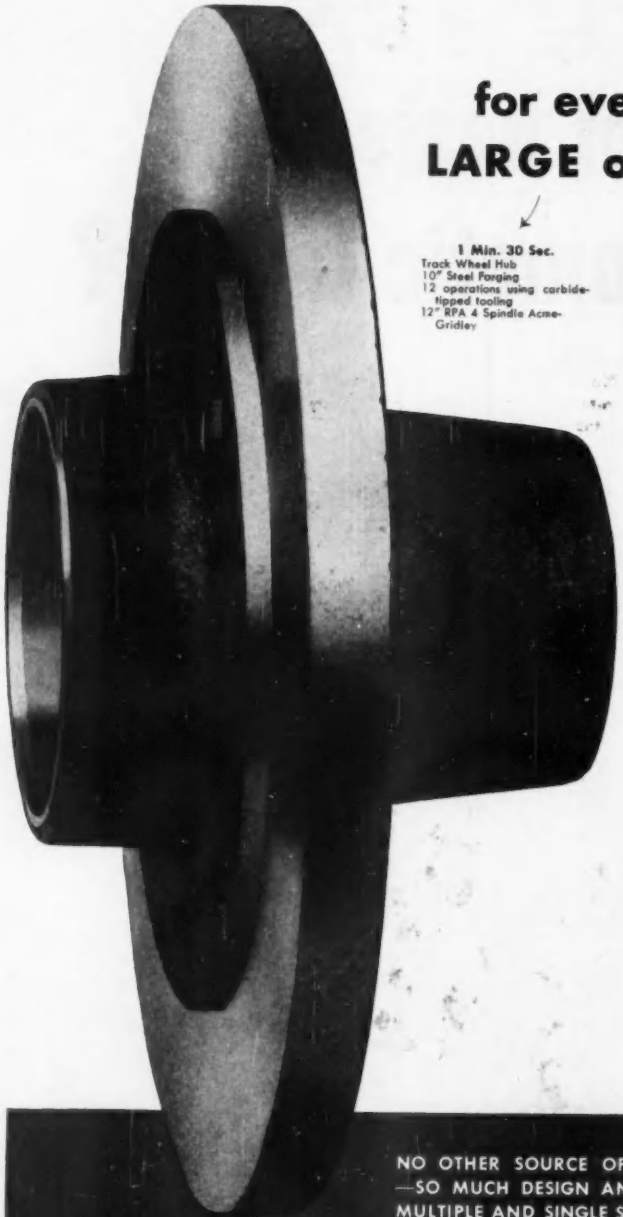

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—Unless your chuckers are built to deliver accurate, dependable, 'round-the-clock production, with a minimum of down time, rejects can quickly run your costs and profit margins into the red. (Rugged, rigid frame construction of the Acme-Gridley, combined with simple, close-coupled, direct cam action and fewer linkages means less wear, fewer adjustments.)

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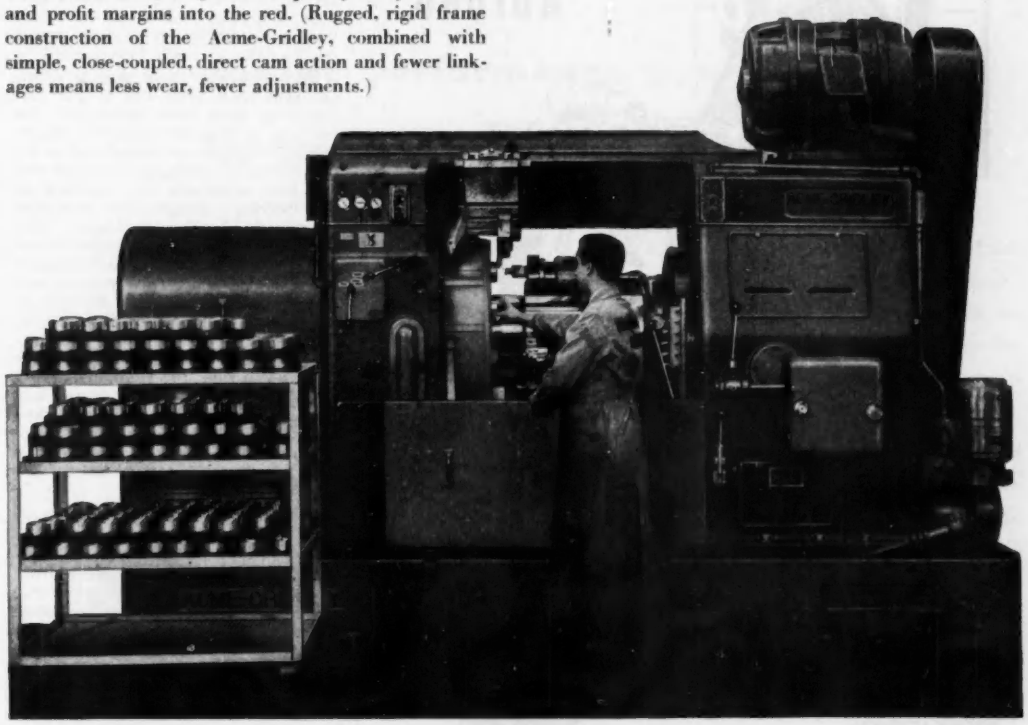
—Complicated single-purpose tooling required on some chuckers to make production guarantees can add needless expense to machining costs—two ways. You pay more for tooling and you pay more for set-up time. Be sure your chucker is *versatile*. (Acme-Gridleys combine simplicity of operation with multi-purpose standard tools, and the ability to use economical power driven auxiliaries—often eliminating costly second operations.)



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High Production Heat Treatment of Steering Gear Parts

(*Continued from page 52*)

type of feed is well adapted to the handling of these small studs and balls. The parts are dumped from containers directly onto the vibrator pan during the charging operation. The oscillating motion of the vibrator unit prevents the parts from bunching up and feeds them to the belt, inside the furnace heating chamber, at a steady, constant rate. The parts are separated enough to insure maximum exposure of each part to the dry cyaniding atmosphere. Production rate of this furnace averages 250-300 lb/hr. The cast alloy belt is 24 in. wide, with three in. vertical side slats, and has a load rating of 20-30 lb per sq ft at operating temperature.

The steering ball studs, made from SAE-8620 steel, are treated to produce a case of 0.010-0.015 in. depth. To achieve this case depth the ball studs are heated to 1575 F for 1-1½ hours in an RX carrier gas atmosphere, enriched with natural gas and ammonia, and quenched in oil directly from heat. The quenching operation takes place in a totally enclosed tank so arranged that the heated parts drop from the end of the furnace conveyor belt through a chute directly into the oil while still exposed to the enriched furnace atmosphere. Since air does not contact the parts, the clean bright surface from the cyaniding is retained. As the parts settle to the bottom of the 2000-gal quench tank, they are picked up by an inclined elevator conveyor and transferred out of the tank and into a suitable container. After a subsequent washing operation, to remove quench oil, the balls are ready for assembly.

The studs undergo a slightly different heat treat cycle due to the fact that they have been carburized just previous to this dry cyaniding operation. The studs are carburized to obtain maximum strength and toughness and then selectively dry cyanided on the wearing surfaces for maximum wear and abrasion resistance. The shank end of each stud is copper plated before the part has been carburized in order to expose only the wearing surface to the carburizing and dry cyaniding furnace atmospheres. These studs, made from SAE-8680 steel, are cyanided to a case depth of 0.008 in. To achieve this case, the studs are heated to 1530-1550 F for 1-1½ hours and quenched in oil. The parts are then washed, and given a draw at 325 F for one hour. They are then ready for the final grinding operation before assembly.

Several other parts in addition to studs and ball studs are dry cyanided in this furnace.

The lever shafts and steering arms are made from SAE-8645 and SAE-1040 steel. These forgings are furnished by vendors and upon receipt are isothermally annealed and mechanically cleaned. Since these forgings are medium carbon steel and do not require carburizing, they are subjected to a clean hardening treatment.

To assure a high rate of production and uniform results, without scaling or decarburization, a Surface Combustion rotary hearth furnace equipped with radiant tubes and a controlled protective furnace atmosphere is used. The rotary hearth in this type of furnace has been found to be ideal for handling the relatively large levers and shafts that are treated. The constant

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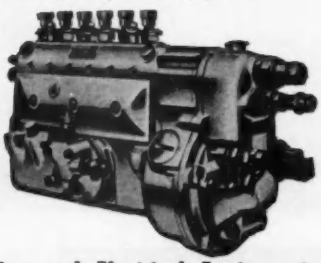

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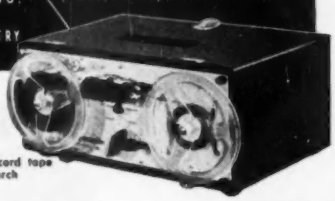

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speed of the hearth surface, on which the parts are placed, insures that each part of the 1000 lb of parts treated each hour is subjected to exactly the same amount of heat for the same length of time. Only one operator is required for continuous operation of this furnace. The operator places the parts on the hearth through the left hand door and withdraws them from the right hand door for quenching. The work moves to the right in a circular path. The working hearth is 24 in. wide and rotates within a circle of eight ft three in. diameter.

The furnace temperature is held at 1550 F and each part is exposed to this heat for approximately 30 minutes. The lever shafts of SAE-8645 steel are quenched in oil; the steering arms of SAE-1040 steel are quenched in water. The oil-quenched parts are then washed.

To relieve any quenching strains, these parts are next drawn for a minimum of 1½ hours at 900-1000 F, for the SAE-1040 arms, and at 1050 F-1160 F for the same period of time for the SAE-8640 shafts. This time is increased for certain parts requiring subsequent machining operations. A mechanical cleaning follows the drawing operation. After cleaning and heat treating, parts are inspected 100 per cent for hardness.

This rotary hearth furnace operates 24 hours a day and during a period of over two years operation it has never been shut down for any kind of repairs. Its results are highly consistent throughout any single heat run. The requirements inherent in properly compounding prepared atmosphere for three distinct heat treat processes—carburizing, dry cyaniding and clean hardening—are complex. Under present conditions of production and capacity, it might have been practical to provide separate generators for each furnace and process being carried out. This, of course, would involve multiple complications in generator operation and product control.

This difficulty was eliminated, after all contemplated atmosphere furnace equipment had been placed in operation, by centrally locating two Surface Combustion RX atmosphere generators of 2400 cfh capacity each, and manifolding the RX carrier gas for all atmosphere requirements.

The basic or carrier was produced by these endothermic generators results from the cracking of a non-combustible mixture of air and natural gas. This mixture is passed through catalyst tubes that are heated to 1850 F by gas burners. The resulting atmosphere, composed essentially of nitrogen, hydrogen and carbon monoxide, is quickly chilled and delivered direct to the furnace heating chambers.

The composition of the carrier gas produced by these generators is easily controllable at the generator. By simply setting a dial which regulates a variable orifice in the mixer, the ratio of air and natural gas are changed to

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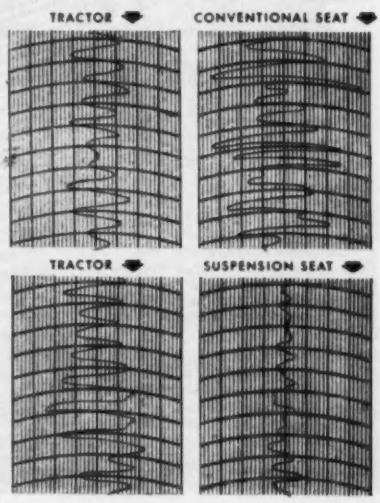

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predetermined limits. Hydrocarbon or ammonia additions at the point of use can further modify this carrier gas for specific requirements. Chart A on the first page of this article shows the compositions of the carrier gas of the atmosphere in the different atmosphere furnaces. See, again, page 50.

The carburizing pit furnaces require 250 cfh of carrier gas and 40 cfh of natural gas, for each furnace. This carburizing atmosphere is substantially the same as that used for dry cyaniding, but is minus the ammonia additions. Although the first pit furnaces incorporated built-in RX generators, all four units are now manifolded to the central RX atmosphere source. Net loads average 1500 lb of cams.

METALS

(*Continued from page* 58)

six months or so, they see primary aluminum capacity above 1,000,000 tons with an additional 420,000 tons from imports and scrap and still further increases in 1953 that will bring total supply close to 2,000,000 tons.

Admitting that aluminum is still in tight supply, the unpleasant thought occurs to copper producers that the situation could change very rapidly to their disadvantage if the Korean war were suddenly to end. Military requirements are taking close to 50 per cent of the current output of aluminum. But by the middle of 1952, unless international conditions become much worse, their percentage of total supplies will be considerably less because of increased output from the new plants. This means more aluminum available to industry and quite likely competition with copper in some markets that have heretofore been considered almost exclusively for the red metal.

The situation has not been helped by much publicized pleading by Government officials to substitute scarce aluminum for scarcer copper wherever possible. Copper producers are up in arms about it. They assert that Washington is painting too dismal a picture of the outlook for copper and their continued emphasis that copper is going to be in continued short supply will scare consumers away from copper and cause them to change over their manufacturing facilities so as to use a substitute. Once this is done it will be a long hard struggle to get them to return to copper, particularly if there is a substantial price saving in the substitute metal, as for aluminum.

Copper production in 1951 from domestic mines is estimated at about 935-940,000 tons by the Bureau of Mines. It would have reached 960,000 tons if strikes had not intervened. Add secondary production, much lower than in 1950, and the smelter output totalled about 1,075,000 tons. Copper imports were lower than in 1950. Copper deliveries to fabricators approximated 1,375,000 tons for the year.

The outlook for 1952 is for a moderate increase in smelter output, possibly as high as 110,000 tons a month. Imports are not likely to increase over 1951, hence a continued shortage of copper for the short term is in prospect. Any substantial increase in domestic output is hardly likely before 1954. The copper price is expected to remain firm and fabricators of non-essential consumer goods are likely to find the metal as hard to obtain as in 1951. NPA has allotted 165,000 tons to brass mills for the first quarter of 1952 and 180,000 tons to wire mills. This exhausts most of U. S. copper supplies.

Steel Inventories

Shipments of steel in the 10-month period January-October of this year as reported by the American Iron & Steel Institute totalled 65.9 million tons, up 11 per cent over the comparable 1950 period. Shipments of alloy steel, aside from stainless, were 4.8 million tons, up 25 per cent. The annual rate of production for the year is estimated at

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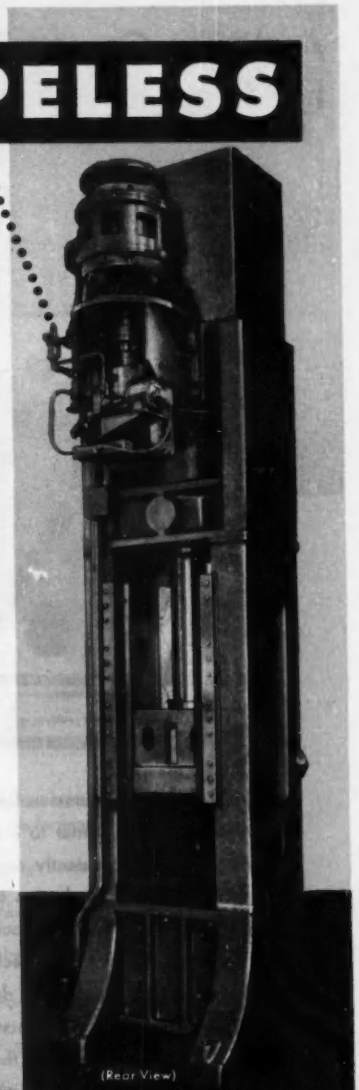

(Rear View)

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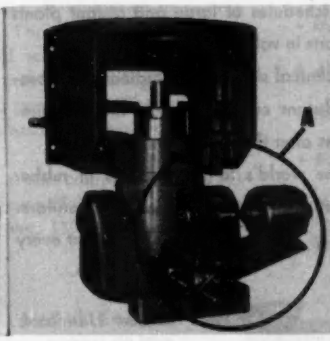

Pumping Unit—front view. "A" indicates pipeless pilot unit. There is one pipe line for the suction line of the pilot pump. Pipe leaks are eliminated.

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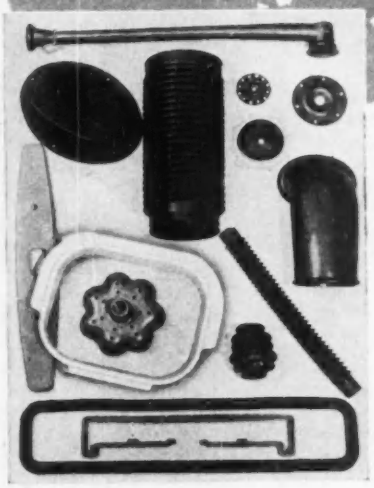

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Address all communications to 754 Belleville Ave., New Bedford, Mass.

104 million tons, double that of 1939, and by the end of 1952 the rate will be 118 million tons.

Considering these imposing figures, sharp conflicting opinions on the outlook are presented by leaders in the steel industry and the Government. The chairman of Bethlehem Steel is quoted as saying in November, "All I can see is overproduction," and a Jones & Laughlin official declares that steel demand has generally been declining and some steel products now require a selling job. This is discounted by defense officials, as well as by U. S. Steel, who deny any drop in demand for structural steel — particularly singled out by Bethlehem as being in less demand.

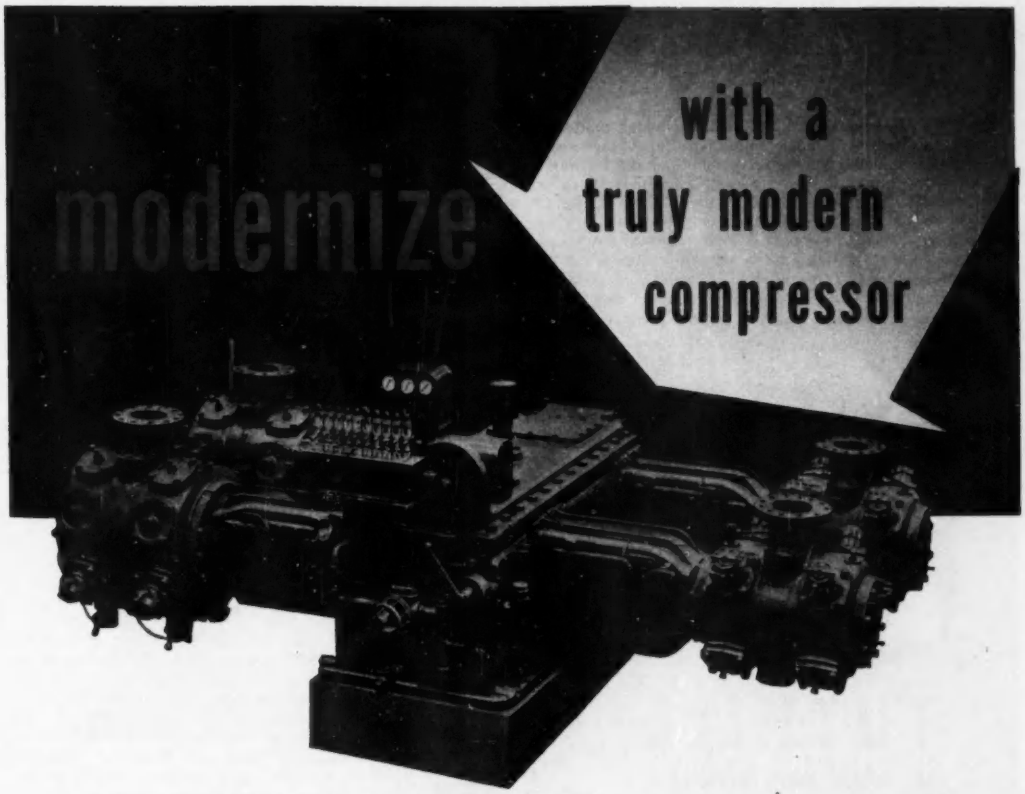
No doubt steel inventories are unbalanced today. In an effort to make sure they obtain at least as much steel as their allotments permit, some consumers have overstated their requirements. They may receive more of one type of steel than they actually need and less of another. Trade circles agree that the terrific pressure for steel that was so evident some months ago has definitely eased. Some steel consumers have reached the limit of their inventory accumulations. The conversion business has died an unlamented death. Formerly hard-pressed steel consumers bought ingot steel and had it turned into finished or semi-finished shapes at another plant, at much higher cost. With tighter OPS rulings which went into effect after Dec. 16, steel speculators have cut prices to unload inventories and this has relieved shortages to some extent. Premium prices for steel are disappearing and grey markets are unlikely to be prominent in 1952.

Some observers think that steel supply could overtake demand much earlier than the Government expects, even as soon as the first quarter of 1952. Because of the cut back ordered in automobile output, a saving of some 1,450,000 tons from that market alone is envisioned. Probably Defense Mobilizer Wilson is right in asserting there is no overall steel shortage but a shortage in certain steel categories. NPA announced it would raise the maximum amount of controlled material that could be bought in each quarter. Small users can certify their own orders for delivery in the second quarter if they don't use more than 30 tons of carbon steel or eight tons of alloy. At present the limit is five tons of carbon and 1000 lb of alloy.

AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of Automotive and Aviation

MANUFACTURING



For your air compressor requirements in the 150-4500 bhp range, no compressor today . . . *no compressor in history* . . . can match the distinct advantages of the Clark Balanced/Opposed, Motor-Driven line.

Truly modern in every respect, it embodies only well established design principles. Thoroughly performance-proved in the toughest kinds of service, Clark Balanced/Opposed units represent the most outstanding industrial air compressor development of our times. Their features and benefits in installation, operation and maintenance are unrivaled.

Obtain *all* the facts today on the complete Clark Balanced/Opposed Compressor line available in 2, 4 and 6 cylinder sizes; 8, 14 and 17" stroke; 150-4500 bhp. Request Bulletin 118.

- *Perfect balance for vibration-free performance.*
- *Space-saving, single unit crankcase*
- *Minimum foundation.*
- *Absence of complex field alignment.*
- *More horsepower in less floorspace.*
- *Rugged, precision construction.*
- *New simplicity and accessibility.*
- *Operated with any kind of drive.*

CLARK BROS. CO., INC. • OLEAN, N. Y.
One of the Dresser Industries

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New York • Tulsa • Houston • Chicago • Boston • Washington
Los Angeles • Birmingham • Detroit • Salt Lake City • San Francisco
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Midget Angle • Right Angle • Big Angle • Electric-Driven • Centrifugal

balanced/opposed COMPRESSORS

Small Gas Turbine for Driving Ship Generator

(*Continued from page* 33)

reduction gear, compressor, and turbine —are connected by splined couplings. Inlet air is inducted through a combination silencer and oil cooler assembly located near the center of the engine, then flows forward through the compressor, is diffused, reversed 180 deg in direction and passes into a single combustion chamber paralleling the compressor. The hot gas produced in the combustor enters a turbine scroll which conducts and distributes it to the first-stage turbine nozzle. At the exit of the turbine the gas is diffused, after which it enters an exhaust collector which discharges vertically upward. An exhaust muffler is located in the exhaust stack.

Reversing the compressor discharge and locating the combustor parallel to the compressor shortens the power plant more than 15 per cent, and is therefore considered worth while despite some pressure loss since length is the critical dimension in this application.

Accessories mounted on and driven from the gear box include the governor, lubricating oil pump, fuel pump, speed sequencing switch assembly, and tachometer generator.

Considerations of the stresses imposed by shock loads indicated that the loads could be absorbed without the use of shock mounts and without significant weight penalty, providing the generator chosen for the installation could also meet this condition. Consequently, the power plant mounts, consisting of a trunnion on each side of the generator and a third support, flexible in the fore and aft direction, under the turbine, do not incorporate isolating media.

for over
70
YEARS
TUTHILL
has solved many equipment problems requiring special
SPRINGS
Since 1880 Tuthill has specialized in designing springs to fit every specific need. Whether your spring requirements are for trucks, buses, automobiles, power shovels, farm wagons or dual and triple axle heavy-duty jobs— Tuthill can meet them quickly and economically. And now, MOLYBDENUM DISULPHIDE (MoS_2) . . . the newest Tuthill extra that keeps springs from *squeaking* and *galling*, is an added Tuthill feature that distinguishes this famous line.
Whatever your spring requirements may be — see Tuthill first!
TUTHILL SPRING CO.
760 W. POLK ST.,
CHICAGO 7, ILLINOIS

Elastic and AGA Plan a Merger

Elastic Stop Nut Corp. of America recently announced the signing of an agreement of merger between itself and American Gas Accumulator Co. Special meetings of stockholders of both companies will be held in February to consider and act upon the proposed merger. Upon the merger of AGA into Elastic, the former's business will be carried on as a division of Elastic under the present AGA management.

AAR Choses Officers for Coming Year

At its annual meeting in Chicago, Ill., recently, Automotive Affiliated Representatives elected a panel of officers for the coming year. Those selected for important posts were: E. D. Newfield, president; Charles Spivack, first vice-president; G. Walter Klier, second vice-president; Lou S. Cohen, treasurer; Carl W. Sharp, secretary, and Ben M. Asch, chairman of the board.

GM Swells Total in Scrap Drive

Between the middle of Nov. and Dec. 14, General Motors Corp. plants, suppliers, and dealers added 10,432 tons of non-production scrap metal to the national stockpile as part of the continuing scrap drive. Scrap collected during the 30-day period is equivalent to about 1915 military 6x6 trucks now being built by GMC. Up to the middle of Dec., the GM contribution to the scrap drive was more than 38,500 tons since July 1, 1951.

when the going's rough...

you can count on

BLOOD BROTHERS ***Propeller Shafts***

Tough . . . long-lived . . . dependable . . they get the power through regardless of extra stress and strain.

If *you* are working toward ever tougher, more dependable trucks, consider this: For 42 years, Blood Brothers has concentrated solely on *solving the problems of transmitting power* through universal joints and assemblies.

Our background of experience is broad — and may prove helpful to you. Why not arrange an engineering conference? No obligation.

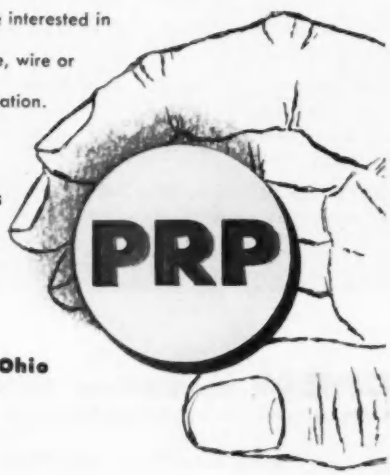
BLOOD BROTHERS machine co. ALLEGAN, MICHIGAN

UNIVERSAL JOINTS AND DRIVE LINE ASSEMBLIES

Division of Standard Steel Spring Company • Chicago Office: Great Lakes Spring Division, 7035 West 65th Street

looking for someone to place painted phenolic parts in your hands?

Plastic Research Products' services include much more than mass production facilities for precision molding. With a job such as this painted phenolic RCA radio cabinet, for example, P R P does a *complete* job. We are one of a very few firms in the industry equipped to produce the piece, paint it, and bake it in our own big-capacity ovens, thus reducing handling, breakage and extra-operation shipments. Our own fleet of trucks and planes delivers the finished work right into your hands. If you are interested in these *extra* services, write, wire or telephone us for information.



when you look for plastic moldings look first to

Plastic Research Products

Urbana, Ohio

CALENDAR

OF COMING SHOWS AND MEETINGS

1952

Brussels Automobile & Truck Show, Brussels, Belgium ..... Jan. 19-30

42nd National Motor Boat Show, New York City ..... Jan. 11-19

Plant Maintenance Show, Phila., Pa. ..... Jan. 14-17

SAE Annual Meeting, Detroit, Mich. ..... Jan. 14-18

Society of Plastics Engineers, Inc. (eighth annual technical conference), Chicago, Ill. ..... Jan. 16-18

Truck-Trailer Manufacturers Association (11th annual meeting), Houston, Texas ..... Jan. 28-30

American Society for Metals Midwinter technical meeting, Pittsburgh, Pa. ..... Jan. 31-Feb. 1

19th Chicago National Boat Show, Chicago, Ill. ..... Feb. 1-10

Automotive Accessories Manufacturers of America Exposition, New York, N. Y. ..... Feb. 4-7

Chicago Automobile Show, Chicago, Ill. ..... Feb. 16-24

National Transport Vehicle Show & Fleet Maintenance Exposition, New York ..... Feb. 26-28

Pacific Automotive Show, Los Angeles, Calif. ..... Feb. 28-Mar. 2

Amsterdam Automobile Show, Amsterdam, Netherlands .. Feb. 29-Mar. 10

ASTM Spring Meeting, Cleveland, Ohio ..... Mar. 3-7

SAE Passenger Car, Body and Materials Meetings, Detroit, Mich .. Mar. 4-6

Fifth National Plastics Exposition, Phila., Pa. ..... Mar. 11-14

ASTE Industrial Exposition, Chicago, Ill. ..... Mar. 17-21

Geneva Automobile & Truck Show, Geneva, Switzerland ..... Mar. 20-30

American Society of Lubrication Engineers, Seventh Annual Meeting and Lubrication Show, Cleveland, Ohio ..... Apr. 7, 8, 9

SAE Aeronautic Meeting, New York, N. Y. ..... Apr. 21-24

Turin Automobile Show, Turin, Italy ..... Apr. 23-May 4

International Foundry Congress and Show, Atlantic City, N. J. ... May 1-7

API Div. of Refining, San Francisco, Calif. ..... May 12-15

American Society for Quality Control (sixth annual meeting), Syracuse, N. Y. ..... May 22-24

SAE Summer Meeting, Atlantic City, N. J. ..... June 1-6

Industrial Finishing Exposition, Chicago, Ill. ..... June 16-20

American Society for Testing Materials (annual meeting), New York City ..... June 23-27

SAE West Coast Meeting, San Francisco, Calif. ..... Aug. 11-13

American Standards Asso., Third National Standardization Conference, Chicago, Ill. ..... Sept. 8-10

nstrument Society of American (sixth annual meeting), Cleveland, Ohio Sept. 8-12

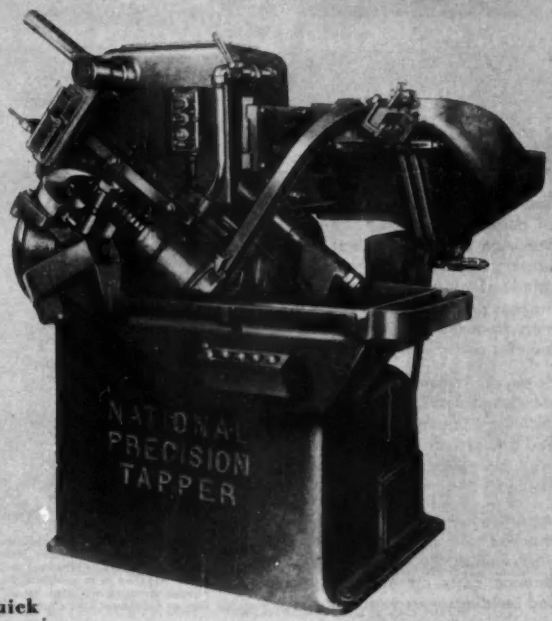
SAE Tractor Meeting, Milwaukee, Wis. ..... Sept. 9-11

Paris Automobile Show, Paris, France Oct. 2-12

37th International Motor Exhibition, London, England ..... Oct. 15-22

Progress IN NUT TAPPING!

NEW SIZES...NEW HIGH SPEEDS...NEW VERSATILITY



NEW SIZES & SPEEDS—You can now tap a complete range of hex and square nuts, from 10-32 up through 1 1/2" National Coarse, at 75 cutting feet per minute!

NEW VERSATILITY—Convert from right to left hand threads (and vice-versa) in only 90 minutes. Longer tap life and better threads result from National's non-reversing, free-floating, 180-degree hook tap. Clean, chip-free nuts are ideal for power wrenching.

NEW DESIGN—New mechanical features, including electrical safety shutoffs, make this entirely automatic tapper trouble-free.

TAP & TOOL CHANGES—Always quick and easy, spell high output and round-the-clock dependability.

TESTIMONIALS—"Our new 1/4" National went into the line today and tapped 42,300 1/4 x 20 nuts in eight hours."

"Only four men operate our 60 Precision Tappers, all Nationals."

"Our new 3/4" National tapped 12,300 3/4 x 20 nuts in eight hours."

"We average 85,000 to 100,000 cold-formed nuts per tap."

"For tapping touchy stainless locknuts for jet aircraft engines, we use Nationals exclusively."

"Our six Precision Tappers—four 1/4" and two 3/8"—have operated 40 hours per week for 12 months, averaging 6,000 gross of cold-formed nuts per week. Tap consumption averaged less than half a tap per machine per week."

"We beat all previous records by tapping 952,000 nuts in one 24-hour day recently on our Nationals."

NATIONAL

MACHINERY COMPANY

TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

Here's How

Thompson Products, Inc.

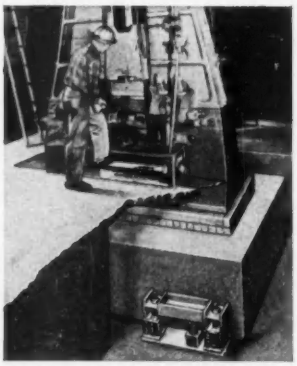
INCREASED PRODUCTION WITH STRAIGHT-LINE WORK FLOW.

. . . by Controlling Hammer Shock

Thompson Products, Inc., manufacturers of automotive, aircraft, and electronic precision parts, found that hammer vibration made accurate work on nearby grinders impossible. In fact, a new building was planned to segregate the hammers from the grinders, sacrificing the benefits of straight-line production.

However, Korfund spring-isolated hammer foundations completely solved the problem—permitted use of the hammers and grinders side by side for maximum production. And no new building was needed.

Materials handling costs were cut, construction costs reduced, hammer and worker efficiency increased, and maintenance costs on hammers, grinders, and buildings were reduced.



Typical spring-isolated foundation for a 2500# steam hammer. Tests prove there is actually a slight increase in hammer blow efficiency. Shock isolation is so complete that a coin will remain standing on edge beside the foundation as maximum blows are struck!

. . . by Shock Mounting Machine Tools

For maximum work-flow on piston machining lines, Thompson installed two automatic boring machines 10 feet apart. With both machines operating, shock transmitted from one to the other caused intermittent skips and gouges.

One machine had to be kept idle until they were both mounted on Korfund steel spring Vibro-Isolators. Now they operate together and turn out perfect work. Yet the cost of Korfund complete isolation was little more than with less effective methods.

Today's automatic machine tools, built to perform several operations in sequence, pay off in high production to close tolerances when protected from external disturbances.

You will find Korfund data sheets in Sweet's Mechanical Industries, Process Industries, Engineering, or Architectural Files. We'll also gladly supply complete information and recommendations, without obligation. Just contact us, or the Korfund representative you'll find in most principal cities. A half century of experience is at your disposal.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

Representatives in Principal Cities

THE KORFUND COMPANY, INC.

48-02 A Thirty Second Place • Long Island City 1, N. Y.

Industry News

(*Continued from page* 24)

Collier Trophy Awarded to Helicopter Industry

The Collier Trophy, one of aviation's highest awards, was presented to the helicopter industry, the military services, and the Coast Guard by President Truman at a special ceremony in Washington, D. C., Dec. 17, 1951. Awarded by a committee appointed by the National Aeronautic Association for the development and use of rotary-wing aircraft for air rescue operations, the trophy was accepted by Igor I. Sikorsky of Sikorsky Aircraft Co.

Allison Building New Turbine Lab

Allison Div. of General Motors Corp. is planning to construct a new experimental engine building adjacent to its jet engine factory. The 125,000 sq ft building will be used for development of experimental turbojet and turboprop engines. The division also plans to build ten jet engine test stands to replace those destroyed in an explosion last summer.

Cornell to Study Improvement of Car Design for Safety

Cornell University has announced a new research program aimed at improving automobile design to eliminate certain hazards. Among contemplated research projects will be engineering studies to produce safer windshields, dashboards and steering wheels, and protective basic structures throughout the vehicle with safer design and shielding of dangerous objects. Findings from the studies will be submitted to automobile manufacturers for use in future design.

Tinted Glass for Cars Gaining in Industry

Tinted glass for passenger car windshields and side and rear windows is rapidly spreading throughout the industry. Last year only four General Motors divisions offered the tinted glass as optional equipment, but now both Chrysler and Ford have it available for new models already announced or upcoming, and it is reported that independent automobile companies also will have it. Libby-Owens-Ford Glass Co. reports that ten times as many windshields with heat and glare-reducing glass are being produced as was the case a year ago. More than 170,000 cars now are equipped with the tinted glass and, since all states except one have given approval for its use, the number is expected to increase sharply from now on.

(*Turn to page* 104, *please*)

COMPLETE SYSTEMS

for ENAMEL • LACQUER • PAINT

Mahon Hydro-Filter Spray Booth Specially Designed to Accommodate the Large Units of Road Building Machinery and Special Vehicles Produced by The Euclid Road Machinery Company, Cleveland, Ohio.

Euclid Heavy Road Machinery and Special Vehicles are Painted in Mahon Finishing System!

A Large Completely Assembled Euclid Rear-Dump Truck Emerging from the Mahon Finish Baking Oven. This is the Exit End of a Complete Mahon Finishing System.

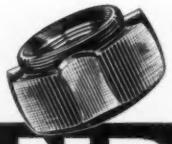
The Mahon finishing system installed in the Euclid Road Machinery Company's plants, Cleveland, Ohio, is another good example of Mahon equipment planned and engineered to meet the unusual requirements of a manufacturer's products and his production methods. The main painting production line for completely assembled products includes a Cleaning and Masking Booth, a specially designed Hydro-Filter Spray Booth, and a Finish Baking Oven. Other Mahon finishing equipment in this company's plants includes three Prime Coat Spray Booths and a Dip Prime Coating System for castings. If you are contemplating new finishing equipment, or have a finishing problem involving such equipment, it will pay you to call in a Mahon engineer. You can do this with complete confidence, because the Mahon organization has pioneered development in this highly specialized field for over thirty years . . . the experience of planning, engineering, building and installing thousands of finishing systems for every conceivable product, under widely varied plant conditions and production requirements, has endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Mechanical Industries File for information, or write for Catalog A-652.

THE R. C. MAHON COMPANY

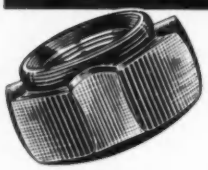
HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Dry-Off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens; Core Ovens, Hydro-Foam Dust Collectors, Dust Traps, Fog-Filters, and other Units of Special Equipment.

MAHON



MIDLAND WELDING NUTS

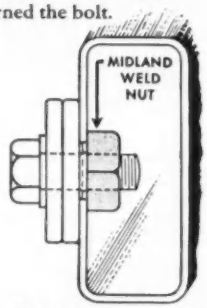


Speed Up Attachment of Metal Parts

THE MIDLAND NUT was originally developed for use in Midland plants, the purpose of its development being to furnish a speedy and inexpensive method of assembling parts into a main assembly. It is particularly useful in positions which are difficult to reach in assembly. The nut is welded to the part so that a bolt can be turned into it without any device to hold the nut from turning. This frequently means that one man can do the work which required two men by the old method where an ordinary bolt and nut were used and one man held the nut in position while the other man turned the bolt.

UNLIMITED USES

The Midland Nut has an almost unlimited number of uses in assembly of any combination of steel stampings where there is difficulty in reaching the nuts and bolts holding the assembly together. With the nut welded in place it is generally much easier to drive the bolt with a power speed wrench than to turn the nut on the bolt and at the same time hold the bolt from turning.

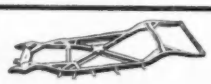


This drawing illustrates how Midland Welding Nuts solve the problem of "blind spots" in the assembly of metal parts.

Investigate this faster and less costly method of assembling metal parts. Write or phone us for complete information.

The MIDLAND
STEEL PRODUCTS COMPANY
6660 Mt. Elliott Ave. • Detroit 11, Mich.
Export Department: 38 Pearl Street, New York, N. Y.

World's Largest Manufacturer of
AUTOMOBILE and TRUCK FRAMES



Air and Vacuum
POWER BRAKES

Air and
Electro-Pneumatic
DOOR CONTROLS

Industry News

(*Continued from page* 102)

Rubber Industry Anticipates New Record in Coming Year

According to a recent statement by H. E. Humpreys, Jr., president, U. S. Rubber Co., the rubber industry will operate near capacity in 1952 to meet the demand for civilian and defense products. It is estimated that sales will exceed by about six per cent the 1951 record of $5 billion. Total rubber consumption for the coming year in the U. S. is figured at 1,336,000 tons, of which 65 per cent will be synthetic.

Government Officials Urge More Intense Scrap Drive

At an emergency scrap meeting, held in Washington, D. C., Dec. 14, Defense Mobilizer Charles E. Wilson and Manly Fleischmann, head of the Defense Production Administration, spoke to an invited group of business and trade paper editors at some length regarding the serious metal scrap supply situation. Both officials urged a speed-up of the present steel scrap drive and the initiation of more vigorous measures to obtain more aluminum, copper, and other non-ferrous scrap. The audience was earnestly requested to publicize the drive even more intensely through their various media to the trades and businesses which they represent.

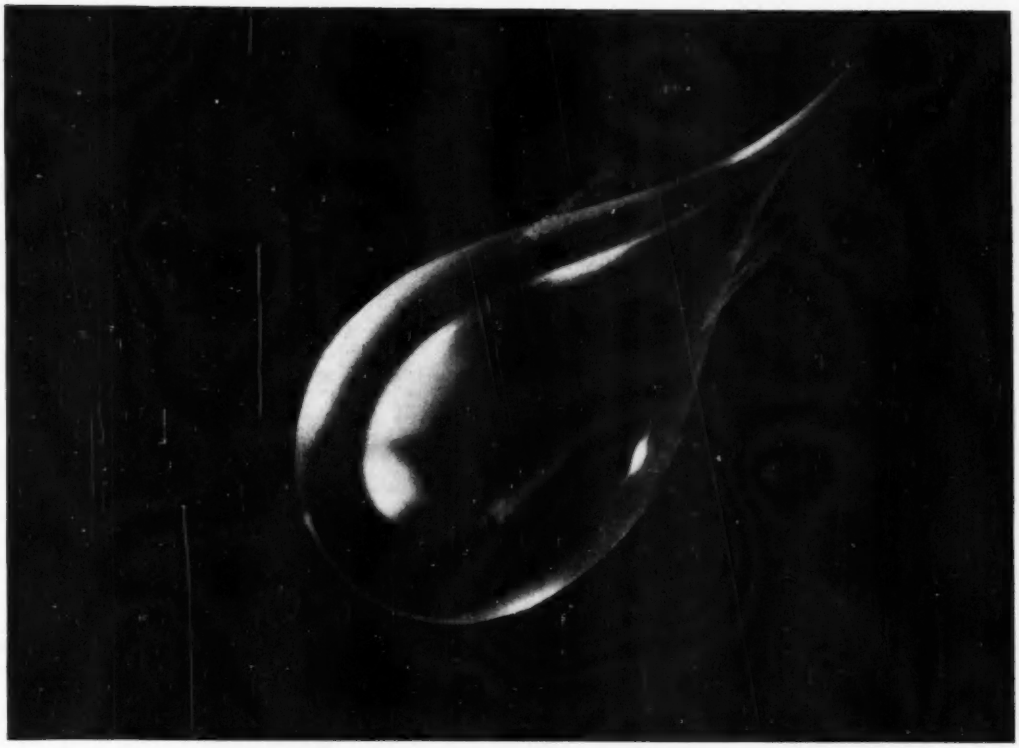
British Announce "Bomb" to Halt Gasoline Blasts

The Society of Royal Aircraft Constructors in England has announced the invention of a "bomb" to prevent warplanes from blowing up in combat when bullets or fire touch off gasoline fumes in fuel tanks. The bomb, which contains carbon tetrachloride, is placed inside the tanks. A built-in diaphragm quickly detects an explosion and releases suppressor gas to dampen it.

Westinghouse Reports Progress on Gas-Turbine Locomotive

Westinghouse Electric Corp. recently released a progress report on its 4000-hp gas-turbine locomotive. The unit continued in experimental service during 1951 with first extensive tests conducted at East Pittsburgh, Pa., during which it burned various grades of residual fuel oils. The locomotive was then placed in revenue service, both passenger and freight, on the Pittsburgh and Lake Erie Railroad. After the testing, changes were made in the fuel system and control apparatus, and improved turbines were installed. Road operation will be continued during 1952 to obtain further experience.

(*Turn to page* 106, *please*)

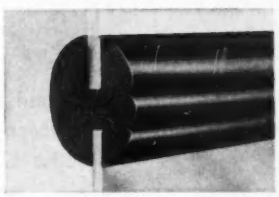


Not a single drop!

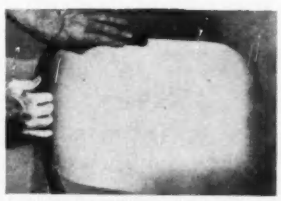
Windshields or fixed windows fitted with Inland Self-Sealing Weather Strip won't leak a single drop of water. The seal is made by the natural resilience of rubber, permanently compressed . . . without cement or binders of any kind. Rain, snow, sleet, ice . . . Inland Self-Sealing Strip weatherproofs against *all* of them!

Original installation is a fast, one-man, low-cost job. So is replacement when glass breaks. That too makes Inland the *best* weather seal for the vehicle manufacturer . . . and for the user. Design and build your vehicles to take it!

INLAND MANUFACTURING DIVISION
General Motors Corporation • Dayton, Ohio



1. Cross-section of Inland Weather Strip.



2. Set the Inland Strip in the body panel.

3. Slip the glass into the Inland Strip.

4. Zip the filler strip into the channel.

INLAND MANUFACTURING

Self-Sealing Weather Strip
(PATENTED)

● MORE THAN 27,000

THERE IS AN EASY WAY TO CONTROL VIBRATION

The easiest way to solve your vibration problem is to put it up to your nearest Lord Field Engineer. He will analyze it and recommend the specific type of Lord Mounting necessary. By drawing upon complete data files of more than 27,000 Lord Mountings and their variations, it is probable that he can solve your problem from this reservoir of available Lord Mountings.

If your vibration trouble involves circumstances which have not been encountered before, your Lord Field Engineer will work closely with you and with engineers at the Lord Factory to design the type of specific Lord Mounting most profitable to you.

For immediate attention to your problem call or write to

BURBANK, CALIFORNIA
Joe B. Hartley
George E. Behlmer
233 South Third Street
ROckwell 9-2151
CHarleston 6-7481

CHICAGO 11, ILLINOIS
Robert T. Daily
Kenneth L. Hanson
Perry C. Goodspeed, Jr.
520 N. Michigan Ave.
Michigan 2-6010

DALLAS, TEXAS
Bruce O. Todd
1613 Tower Petroleum Building
PRospect 7996

DAYTON 2, OHIO
W. Webster Dalton
238 Lafayette Street
MIchigan 8871

DETROIT 2, MICHIGAN
Everett C. Vallin
731 Woodward Ave.
TRinity 5-8239

NEW YORK 16, NEW YORK
Vincent Ellis
Jack M. Weaver
280 Madison Avenue
MUrray Hill 5-4477

PHILADELPHIA 7, PENNSYLVANIA
George P. Harrington
725 Widener Building
LOcust 4-0147

ERIE, PENNSYLVANIA
Paul E. Dailey
Harry C. Sapper
1635 West 12th Street
2-2296

LORD MANUFACTURING COMPANY • ERIE, PA.

LORD BONDED RUBBER

HEADQUARTERS FOR
VIBRATION CONTROL MOUNTINGS
. . . BONDED RUBBER PARTS

Industry News

(*Continued from page* 104)

ASM Meeting to Include Many Technical Papers

The mid-winter meeting of the American Society for Metals, to be held in Pittsburgh, Pa., Jan. 31 and Feb. 1, will be devoted exclusively to technical papers dealing with continuing research in metallurgy. Subjects to be covered will include: titanium and its alloys; problems of embrittlement; studies of high temperature effects and oxidation; non-ferrous alloys; and problems associated with transformations and grain growth in metals and alloys.

Transport Show Scheduled For Feb. in New York

According to a recent announcement, the 1952 National Transport Show & Fleet Maintenance Exposition will be held in New York City, Feb. 26 to 28. The affair is designed to provide a center where fleet executives and maintenance and operating personnel may assemble to consider new and improved features of vehicles, components, fittings, test equipment, maintenance tools, services, terminal equipment, etc., and where practical demonstrations afford a clinic of approved maintenance practices.

Automobile Congress Set for Madrid

An international technical automobile congress will be held in Madrid, Spain, Oct., 1952, under the sponsorship of the F.I.S.I.T.A., a general organization of all European national technical societies. The program will cover three divisions: performance, comfort and safety, and maintenance.

Tucker Report Lists $9.9 Million in Claims

The latest report on Tucker Corp. lists claims as more than $9.9 million and assets of $381,491, not including Aircooled Motors, Inc., a Tucker subsidiary which is being offered for sale at $2.5 million. The trustees' report showed that Aircooled Motors has assets of more than $2.5 million and liabilities of $970,377, in addition to military contracts amounting to $6.475 million.

Spencer Named to RFC Post

Leland E. Spencer, vice president, Kelly Springfield Tire Co., has been appointed chief of the Synthetic Rubber Div., Reconstruction Finance Corp. He was formerly director of the Rubber Div., National Production Authority.

Easy to See...
Easy to Remember...
Easier to Sell!

Caterpillar Diesel Tractor and Wagon working on the Garza-Little Elm Dam project at Louisville, Texas. An R-M enamel has to be good to stand up under these working conditions.

You can't miss a Caterpillar Machine finished in R-M "Hi-way" Yellow!

● CATERPILLAR equipment catches the eye with Color . . . very durable, very rugged R-M "Hi-way" Yellow. *Easy to see,* it not only helps prevent accidents but draws attention to the Caterpillar name. *Easy to remember,* its consistent use promotes equipment sales through easier identification with the product name. R-M lacquers, enamels and undercoats are used on the finest passenger cars in America, on hard working farm and earth-moving equipment, on giant Diesel locomotives and many others. Ask us how R-M color can work for your product!

Write for descriptive booklet on U. S. Government Specification Finishes

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RINSHED-MASON CO.

Manufacturers of fine lacquers, enamels and undercoats for leading products of industry.

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1244 N. LEMON ST. . . . ANAHEIM, CALIF.

THE
RIGHT COMBINATION

Layne offers you the right combination of unmatched experience plus modern equipment for installing well water supply units of any size—and for any purpose. Layne has made more water supply installations than any other firm in the entire world, and this valuable experience places Layne in a position to unquestionably do every job exactly right. Once the installations have been made, a complete record of everything is kept; strata formation, sand porosity, casing details, sand screen length, diameter and metal used, all pump information including bearings, shafting, impellers and operating characteristics. With such information, Layne is always in a position to give quick and most economical service for adjustments or repairs if and when needed.

Everything by Layne

Layne accepts your contract for furnishing everything; Layne supervision, Layne drill crews, Layne drill equipment, Layne designed and Layne built louver type sand screen and Layne high efficiency vertical turbine pumps. No other firm is involved, therefore there is no divided responsibility. This plan gives you the very finest well water supply units that world wide experience and skill can build.

Layne offers a wide range of fully illustrated catalogs covering all phases of well water installations for all types of industry. Write for more information to

LAYNE & BOWLER, INC.

General Offices, Memphis 8, Tenn.

Layne
WATER SUPPLY
WELLS & PUMPS

MEN *in the* NEWS

(*Continued from page* 25)

Standard Products, Inc.—**Claude E. Mann** has been promoted to vice-president in charge of Aircraft Parts and Hardware, and **Keith Detrich** has been selected manager of the Aircraft Hardware Dept.

Consolidated Engineering Corp., Transducer Div.—**Joseph H. Lancor, Jr.,** has been appointed director.

Northrop Aircraft, Inc.—**W. R. Clay** has been named director of missile development.

Wellman Bronze & Aluminum Co.—**Don S. Smith** has been appointed vice-president in charge of production.

Nash - Kelvinator Corp. — **Godfrey Strelinger** has been elected secretary, succeeding **Horace J. Mellum,** retired.

Detrex Corp., Alkali Products Div.—**W. H. Webb** has been appointed sales manager.

Ethyl Corp.—**James E. Boudreau** has been named director of public relations.

Young Radiator Co., Aeronautical Products Div.—**Gene T. Neudeck** has been chosen sales manager.

Round California Chain Co.—**Arthur H. Luchs** has been elected vice-president.

Ford Motor Co. of Canada, Ltd.—**J. M. Cochrane** has resumed his former post as vice-president. **Kenneth O. Grant** succeeds him as director of mechanical transport in the Defense Production Dept.

Gould-National Batteries, Inc., Automotive Starting Div.—**Niles J. Thompson** has been named engineering and development director.

Stanley Aviation Corp.—**William H. Baines** has been appointed factory superintendent.

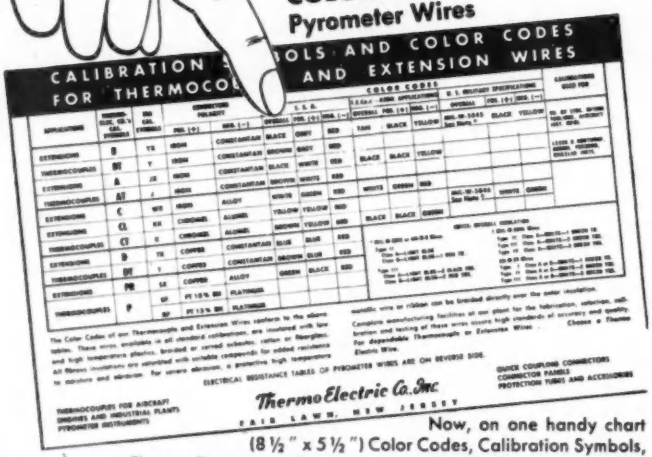
Caterpillar Tractor Co.—**Edward C. Lipman** has been named a director.

Clearing Machine Corp., Hamilton Div.—**Warren G. Rosendahl** has been named assistant general manager.

General Electric Co., Apparatus Sales Div.—**S. Vernon Travis** has been appointed manager of the new sales standards section.

(*Turn to page* 110, *please*)

AT YOUR FINGER TIPS
COLOR CODES for Pyrometer Wires



Now, on one handy chart (8½" x 5½") Color Codes, Calibration Symbols, Thermo Elements of Thermocouple and Extension Wires for ISA, U.S. Military and Aeronautical Specifications — Plus — Resistance Tables.

Write Today for your copy. No obligation, of course.

Thermo Electric Co., Inc.
FAIR LAWN, NEW JERSEY

. . . *to Build Every Type of* SHEET METAL DIE

The 1000 ton press shown in the background of the above illustrations is one of a number of tryout presses of varying capacities in operation in Richard Brothers Division die shops. This particular press, with a bed measuring 120″ by 204″, has capacity for tryout of extremely large dies. Many other types of equipment, including ten duplicating machines, give Richard Brothers the facilities to produce sheet metal dies of virtually every size and type.

Here, too, are the men who know how to use this equipment — men with years of experience and proven ability in die design and die building. When Allied equipment and manpower go to work for you, you can be sure of dies that will give you maximum production and economy.

Other ALLIED PRODUCTS

HARDENED AND PRECISION GROUND PARTS • SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • ALLITE ZINC ALLOY DIES • JIGS • FIXTURES • R-B INTERCHANGEABLE PUNCHES AND DIES

PRECISION · EXPERIENCE · DEPENDABILITY

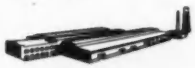
ALLIED PRODUCTS CORPORATION

DEPT. D-4 · 12645 BURT ROAD · DETROIT 23, MICH.

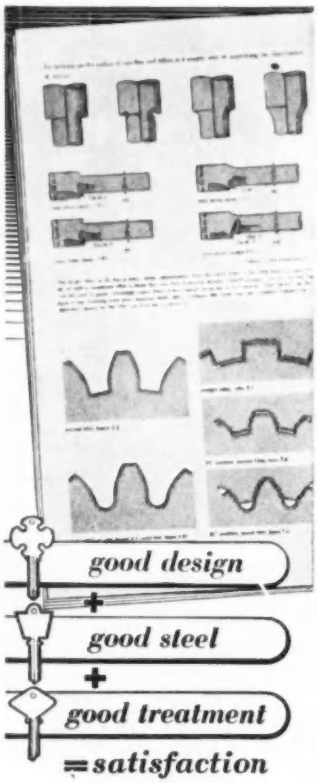
PLANT 1
Detroit, Mich.

PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.



PLANT 4
Hillsdale, Mich.



If you are a design engineer seeking success with steel components, you will find help towards your goal on every page of this 72 page booklet. Write now for "3 Keys to Satisfaction"—it is valuable and it is free.

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MOLY

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MEN *in the* NEWS

(*Continued from page* 108)

Chefford Master Manufacturing Co., Inc. — **Henri Barre** has been elected vice-president in charge of production.

Luscombe Airplane Corp. — **W. A. Tweedie** has been named factory manager.

McCord Corp.—**Dean S. Fields,** vice-president in charge of manufacturing, has been named a director, succeeding **A. C. McCord,** retired

Hanson-Van Winkle-Munning Co.—**Bernard C. Case** has been appointed manager of Electrochemical Development.

Bendix Aviation Corp., Bendix Products Div.—**Earl R. Price** has been appointed chief engineer for vacuum power products. **W. R. Williams** has been advanced to the post of executive engineer.

Vanadium Corp. of America—**George C. Floyd** has been elected vice-president.

Air Reduction Co. — **J. H. Humberstone** has been elected a vice-president.

Automatic Transportation Co.—**Harvey J. Hincker** has been named chief engineer of the Automatic Dept.

Curtiss-Wright Corp., Aeronautical Div.—**W. Kenneth Houpt** has been named sales manager.

Chrysler Corp. — **J. D. Moran** has been named director of material controls. **W. J. Jones** has been appointed supervisor of the central routing department, and **E. B. Daniels** has been chosen as his assistant.

Texas Engineering & Manufacturing Co., Inc.—**Jack Melton** has been promoted to superintendent of materials.

Cullman Wheel Co. — **Norman B. Weinke** has been elected vice-president.

Kaiser-Frazer Corp. — **B. M. Laney** has been made assistant works manager for all aircraft shifts at the Willow Run, Mich., plant.

Cutler-Hammer, Inc. — **Philip Ryan** has been named executive vice-president, **R. A. Millermaster,** manager of the Developmnt Dept., and **C. W. Kuhn,** director of development engineering.

Pyrene Manufacturing Co.—**Luis E. Eckelmann** has been elected vice-president.

Waukesha Motor Co. — **Charles E. Nelson, Jr.,** has been elected a director.

WITTEK

NOC-OUT HOSE CLAMPS

The Standard of the Automotive Industry

Type A—Radiator Hose Connections

Type G-BB—Booster Brake Hose Connections No. G-B-HH for Hot Water Heater Hose

Type HP—High Pressure Hose Connections

Wittek Noc-Out Hose Clamps are designed in a variety of types made in many sizes for use by the automotive industry. Because they provide the most practical leakproof hose connection, they are specified by the leading manufacturers as standard, original equipment for automobiles, buses, trucks and tractors.

Write for descriptive literature.

Automotive HOSE CLAMPS

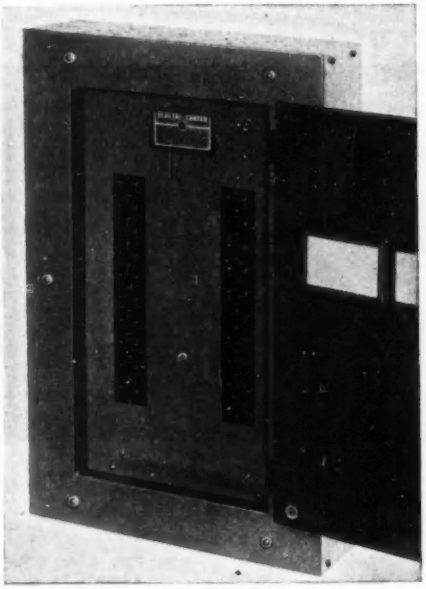
WITTEK MANUFACTURING CO.

4319 W. 24th Place, Chicago 23, Ill.

Dependability in Hose Clamps for Over a Quarter of a Century

NOW! Get immediate delivery on lighting panels up to 42 circuits from your supplier's stocks

Another great forward step by BullDog to simplify ordering, stocking and use of electrical equipment



The basic device principle has now been extended to all Pushmatic Electri-Center lighting panelboards up to 42 circuits.

BullDog Electri-Center Panelboards are now available from local stocks. Just choose the basic device that fits your circuit requirements . . . select the additional Pushmatic unit you need at the time . . . and get a complete panelboard right over the counter. A flexible panelboard, that lets you *add extra circuits later,* when needed.

Now, no more special ordering and long waits when you need panelboards in a hurry. You get immediate delivery on a top-quality item that was once custom-made. You get savings, because these BullDog panelboards are now mass-produced, and cost less. Only 5 panels replace hundreds of catalog numbers, cover all your needs up to 42 circuits . . . make ordering and stocking easier.

Ask your local supplier for Bulldog Pushmatic Electri-Center Panelboards.

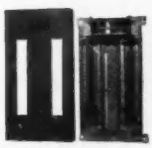
BULLDOG
Pushmatic Electri-Center Panelboards

- For plants, commercial buildings, institutions.
- Underwriters'-approved up to 42 circuits.
- Meets Federal specifications WP 131a Class A.
- Push-button switching and automatic circuit protection. No reset position.
- Individual Pushmatic units (Thermal Magnetic) rated 15, 20, 30, 40 and 50 Amps; quick-mounting, fully interchangeable.
- Code Gauge steel fronts, flush or surface type.
- Code Gauge steel boxes with ample knockouts in removable ends.
- 4"-wide gutters for easy wiring.
- Provisions for Main Lugs at top or bottom.
- Flexible from every standpoint.

Write for Descriptive Bulletin No. 513

Now from your supplier's stocks . . . 5 boxes . . . 5 fronts . . . 5 interiors . . . plus Pushmatic units . . . eliminate hundreds of confusing catalog numbers and let you get immediate delivery on these two complete BullDog panelboard lines.

Boxes: 26", 32" and 38" high. All 20" wide; 5½" deep. Ample knockouts.



Basic Device principle. Four Pushmatic circuit breakers and fillers supplied with the two single-phase interiors; six with the three 3-phase, 4-wire interiors. Space to add up to 36 extra circuits later.

Fronts: Either flush or surface type. Sturdy. Attractive gray finish. Separately packaged.

Thermal Magnetic Pushmatics. Famous "Push, it's ON, Push, it's OFF. Push, it's ON again" operation. Extra safety, extra convenience. Stock them yourself . . . have them ready when you need additional circuits.

TWO COMPLETE LINES

Single-Phase, 3-wire, Solid Neutral

(P2B-304-28L) 28 circuits Max., Mains 200 amp.
(P2B-304-40L) 40 circuits Max., Mains 200 amp.

3-Phase, 4-wire, Solid Neutral

(P3B-406-21L) 21 circuits Max., Mains 100 amp.
(P3B-406-30L) 30 circuits Max., Mains 100 amp.
(P3B-406-42L) 42 circuits Max., Mains 200 amp.

BULLDOG

BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

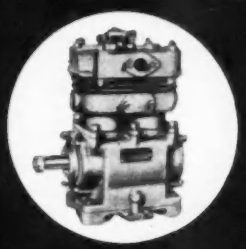
PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

THE WORLD'S MOST TRIED AND TRUSTED

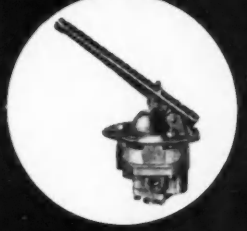
AIR BRAKES

Feature for Feature

the Finest Complete Braking System money can build or buy!



The Bendix-Westinghouse Compressor—heart of the air brake system—performance proven over more miles on more installations than any other compressor available!



The Bendix-Westinghouse Brake Valve—main control of the system—unsurpassed for fine graduation and perfect control under *all* braking situations on *any* size vehicle.

The Bendix-Westinghouse Governor—hard-working watchman of the system—provides unexcelled assurance of adequate air pressure at all times to meet every braking need.

If you want a full 100% return on every dollar you invest in braking, it will pay you many times over to specify Bendix-Westinghouse Air Brakes for your trucks and buses. Why? Because only a complete braking system can give your vehicles the kind of performance that means highest operating efficiency at lowest operating cost. And with Bendix-Westinghouse you get the finest complete braking system money can build or buy! That's because each and every component part in the Bendix-Westinghouse system is designed to perform a specific function and to perform it better than any other make or model. For example, the rugged Bendix-Westinghouse compressor is noted for its long, reliable, trouble-free service; the brake valve for its greater capacity, finer graduation, faster application and release; the governor, for its extra dependability and ease of maintenance due to its mounting position away from high engine temperatures and excessive vibration. Put them all together with rugged Bendix-Westinghouse brake chambers and slack adjusters and they truly add up to tops in stops. Take advantage of it—specify Bendix-Westinghouse, the world's most tried and trusted air brakes!

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY

ELYRIA, OHIO BERKELEY, CALIFORNIA

It's an old automotive industry custom

BRAZING FITTINGS TO TUBING WITH EASY-FLO

• For many years, it has been the vogue in the automotive industry to attach fittings to tubing by brazing with EASY-FLO. In the aviation industry too, this has been common practice. The reason is simply this—this low-temperature silver brazing alloy just naturally and consistently makes the strong, permanently leak-tight joints such applications demand—and it does it fast and at surprisingly low cost.

Just one example . . .

• It's the HYDRAGUIDE, the Gemmer hydraulic steering gear, used at present in Chrysler automobiles. Fittings are induction brazed to copper-coated Bundy tubing, 6 at a time, with rings of 3/64" EASY-FLO35 wire preplaced. Joints will easily take any stresses and strains the tubing itself will stand.

Photos courtesy of National Induction Heating Co. and Gemmer Mfg. Co., Detroit

BULLETIN 20 *tells why and how*

This 24-page bulletin makes crystal-clear why strong, leak-tight joints and fast, low-cost production are inherent in EASY-FLO brazing, and how to put the alloys to work. Write for a copy today.

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FOUNDED 1867
QUALITY SERVICE
ORIGINATORS OF EASY FLO & SIL FOS

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General Offices: 82 Fulton St., New York 38, N.Y.

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ASK **BAIRD** ABOUT IT!

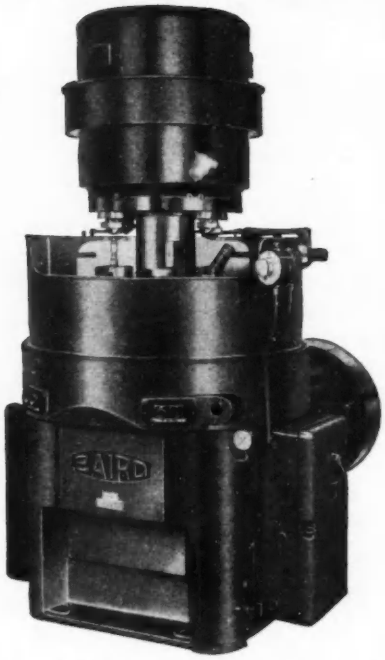
HIGH PRODUCTION TOOLING

GOOD WAY TO BREAK A PARTS BOTTLE NECK . . .

Just the type of machine smart production men are looking for *NOW*

because:

1. It's very ***compact.***
2. It's very ***easy*** to tool and operate.
3. It's very ***simple*** and dependable.
4. It's extremely ***accurate.***
5. It's unusually ***versatile.***
6. It regularly turns in ***outstanding*** production records.



BAIRD NO. 54VC 4 SPINDLE VERTICAL LATHE

The versatility of the Baird No. 54VC (automatic vertical continuous lathe) makes it a most valuable machine for wet or dry cutting of light jobs such as boring piston ends, facing, chamfering, turning bands, etc. It has 4 spindles with 5" chucks mounted in the turret which revolves continuously, eliminating non-productive indexing time. The grip of holding fixtures automatically release for operator to load and unload. Tools feed in and out of the cutting stroke.

Tools move horizontally for facing operations while other tools operate vertically for turning. Worm and gears drive the turret . . . spindles, mounted in roller bearing are driven by helical gears. Fool-proof controls prevent feed of tools to work unless spindles are revolving. Splash guard (as pictured) is used for wet operation. Speed changes are simple, inexpensive.

Baird engineers will provide tooling recommendations and case histories of accurate, fast, profitable production. Bulletin and specifications on request.

the **BAIRD MACHINE COMPANY**
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

2BA52

Another development using

B. F. Goodrich Chemical Company *raw materials*

These "O" Ring Seals made by Precision Rubber Products Corp., Dayton, Ohio. B. F. Goodrich Chemical Company supplies Hycar rubber only.

rubber "O" rings for tractors

FOR BETTER DESIGN, LONGER LIFE

REPLACING the special oil in a tractor hydraulic system can lead to trouble if any oil at hand is used—as often happens. For oil is tough on rubber—attacks the rubber sealing rings of the hydraulic system. Result—hydraulic system is less efficient and valuable time is often lost.

But now there's a new kind of "O" ring seal—a rubber "donut"—that is usable with almost *any* petroleum-based hydraulic fluid. It is made from a specially developed, extremely oil-resistant Hycar rubber compound that also has exceptionally good high and low temperature resistance. As many as 25 of these rubber "donuts" are used in some tractor hydraulic systems.

Here again Hycar demonstrates its versatility. For Hycar compounds can be made to resist oil, gas, many chemicals . . . heat and cold . . . weather, abrasion and more damaging conditions.

Hycar rubber may also be used as a synthetic resin modifier, a latex for coating or impregnating, an adhesive, and in many other applications. One of the many Hycar rubber compounds may be just what you need to improve or develop a product. Write for helpful technical bulletins or assistance. Please address Dept. HG-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers
HARMON organic colors

Need high tensile strength? Hycar has it—plus abrasion resistance and more advantages.

Hycar
American Rubber

On Battle Roads or Highways
ELASTIC STOP NUTS
Guarantee Tight Fastenings

Rough terrain and rough handling are hazards to the world famous military 'Jeep'. That's why Willys builds its 'Jeeps' and other vehicles with Elastic Stop Nuts at important points to eliminate fastener failures due to vibration.

In this vehicle the famous Red Locking Collar of the Elastic Stop Nut holds firm against vibration—reduces maintenance—on vital applications such as: accelerator hinge, universal joints, body hold down, spring shackles, radiator hold down, and air cleaner. The Red Collar grips bolt threads firmly—protects against vibration, impact, and stress reversal—prevents freezing of nuts to bolts by protecting internal bolt threads against corrosion.

Check the advantages of Elastic Stop Nuts against any other type of self-locking fastener. You'll find that only ESNA offers a complete line of thread sizes and varied nut types engineered to simplify your assembly line fastening problems and to provide your customers with maintenance-free operation.

Whether you are manufacturing equipment for rough military use or designing better performance and easier maintenance into equipment for your normal market . . . use vibration-proof fasteners. Now is the time to get full information. Write for complete product line bulletin to Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, N. J.

DESIGN AHEAD WITH ESNA

THE FAMOUS RED ELASTIC COLLAR IS VISIBLE EVIDENCE OF LOCKING SECURITY

Threadless and permanently elastic, it provides these 4 outstanding features:

1. **Protects against nuts loosening due to VIBRATION**
2. **Keeps locking threads CORROSION FREE**
3. **Provides for accurate BOLT LOADING**
4. **Seals against LIQUID LEAKAGE along the bolt threads**

And can be used again and again

ESnail® ESNA ROLLPIN

ELASTIC STOP NUTS

DESIGN HEADQUARTERS FOR SELF-LOCKING FASTENERS

ALCOA invites you...
...to visit its booth, Parlor C, at the S. A. E. Engineering Display, January 14-18, Sheraton Cadillac Hotel, Detroit, Mich.
...to see the latest and most significant uses of aluminum for the automotive industry.
...to discuss these applications with Alcoa technical personnel.

FINISHES

New alumilite finishes & new aluminum-pigmented enamels.

ALCOA UTILITUBE

Coiled tube combines easy workability, high fatigue strength, long lengths, and low cost.

AUTOMOTIVE WIRE

Samples of aluminum insulated wire used in automotive wiring. Demonstrations of new welding methods for joining electrical wiring.

BRAZED CYLINDER HEADS and CRANKCASES

Samples of cylinder heads and crankcases that are cast in sections and brazed together.

BRAZED ALUMINUM RADIATORS

Samples of brazed thin gauge aluminum heat exchangers and various aluminum radiator materials.

ALCOA ALUMINUM ®

ALUMINUM COMPANY OF AMERICA 1841A GULF BLDG. PITTSBURGH 19, PA.

WHAT'S THE FASTEST WAY TO CLEAN METAL?
See page 11
WHAT'S THE MOST ECONOMICAL WAY?
See page 9
Some good things to know about Metal Cleaning
OAKITE PRODUCTS, INC.

Oakite's New FREE Booklet

"Some good things to know about Metal Cleaning"

answers many questions that mean better production for you, more money in your pocket. You'll want to read more about:

Can one cleaning material do all metal-cleaning jobs? *See page 5.*

What kind of cleaner attracts both oil and water? How does this help remove buffing compound residues and pigmented drawing compounds? *See page 8.*

What are the advantages of reverse current for electrocleaning steel? *See page 15.*

Can you electroclean brass without tarnishing? *See page 18.*

Can you clean steel and condition it for painting for less than 20 cents per 1,000 square feet? *See page 26.*

Would you like a cleaner that removes rust and oil in one operation, often eliminating all need for pickling? *See page 28.*

Does your burnishing produce a luster you are proud of? *See page 32.*

FREE For a copy of this 44-page illustrated booklet, write Oakite Products, Inc., **16A** Thames St., New York 6, N. Y.

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OAKITE

MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. & Canada

UNITED SPECIALTIES

Pre-Cleaner

DUST LEVEL
UNITED PRE-CLEANER
IMPORTANT
THIS PRE-CLEANER DOES NOT ELIMINATE SERVICING OF THE OIL BATH AIR CLEANER, BUT PROLONGS THE SERVICE PERIOD.
EMPTY WHEN DUST LEVEL IS REACHED. REMOVE WING NUT ASSEMBLY AND LIFT PLASTIC BODY FROM BASE, SHAKE DUST FROM DIRT COMPARTMENT, AND REPLACE CLEANER.
UNITED SPECIALTIES CO., Chicago, Ill., U.S.A.
DUST LEVEL

★ FITS PRACTICALLY ANY AIR CLEANER

★ HAS TRANSPARENT PLASTIC SHELL

This pre-cleaner, recently designed by United Specialties engineers, can be easily attached to practically any center tube air cleaner installation . . . adaptable to 95 percent of all wheel tractors, agricultural equipment and industrial power units.

Attached to the regular oil bath air cleaner, this unit removes a large percentage of chaff, dust and linty materials from air before it enters the filter unit of the oil bath air cleaner. The pre-cleaner prevents clogging — keeps the air cleaner operating at top efficiency.

We invite your inquiry regarding the new United pre-cleaner or any of the many United Oil Bath Air Cleaner designs.

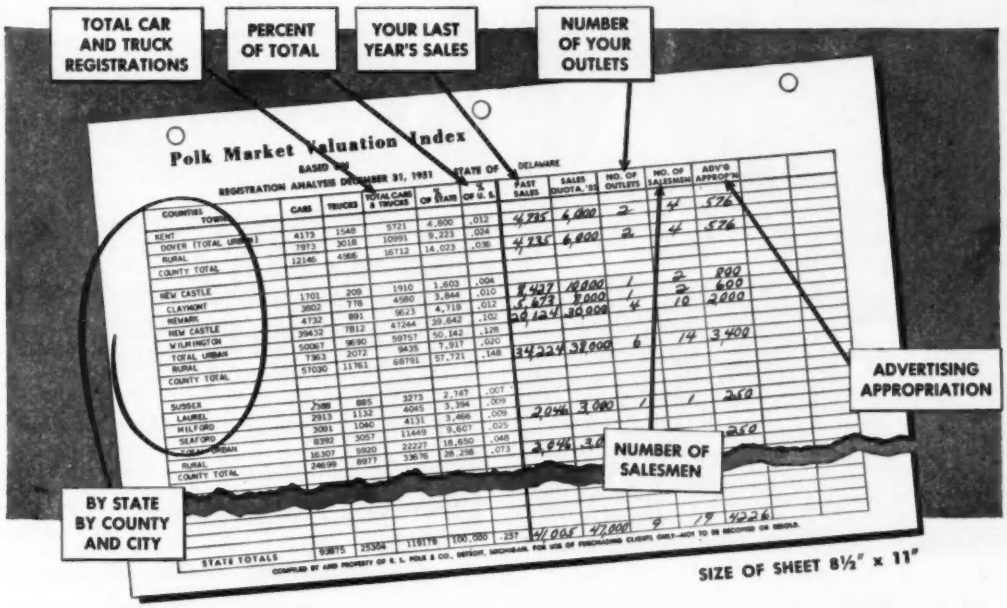
UNITED SPECIALTIES COMPANY

United Air Cleaner Division — Chicago 28
Mitchell Division — Philadelphia 36
Birmingham 11, Alabama

AIR CLEANERS ★ METAL STAMPINGS ★ ROLLED SHAPES
IGNITION AND TURN SIGNAL SWITCHES ★ DOVETAILS

NEW... for '52

POLK MARKET VALUATION INDEX


TOTAL CAR AND TRUCK REGISTRATIONS
PERCENT OF TOTAL
YOUR LAST YEAR'S SALES
NUMBER OF YOUR OUTLETS
ADVERTISING APPROPRIATION
NUMBER OF SALESMEN
BY STATE BY COUNTY AND CITY
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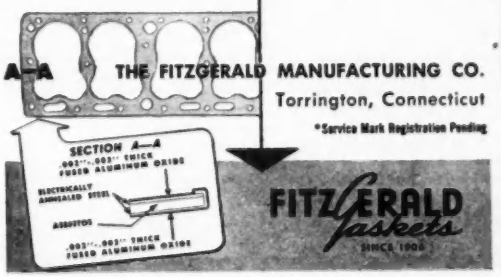

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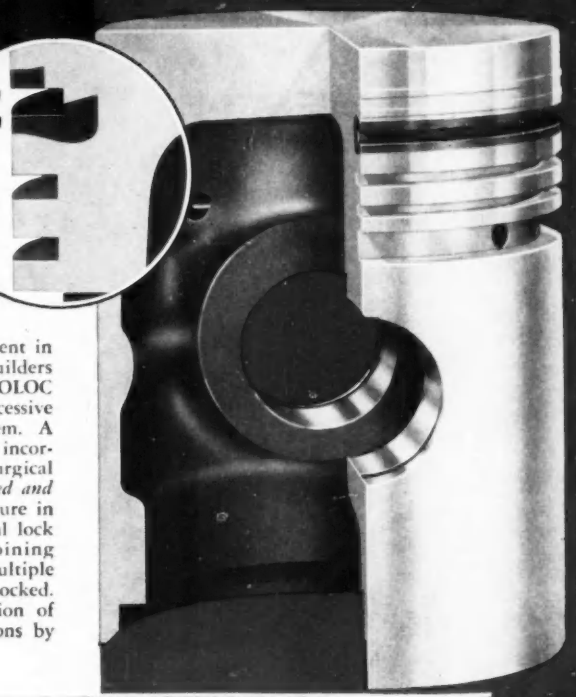

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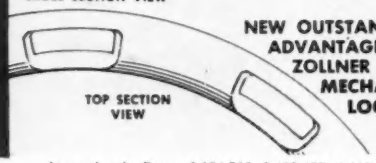
Now, another great advancement in piston design is made available to engine builders by Zollner engineers. It's the new BONDOLOC Piston for heavy duty engines where excessive top ring groove wear has been a problem. A "Ni-resist" iron groove section is *permanently* incorporated in this piston by *both* Al-fin metallurgical and Zollner mechanical bond — *double bonded and locked* to positively prevent separation failure in any service. The exclusive Zollner mechanical lock with reverse angles on every surface joining "Ni-resist" iron and aluminum provides a multiple dovetail bond which is infinitely wedge-locked. Zollner engineers invite immediate discussion of the many advantages of BONDOLOC Pistons by application to your engine.



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*T.M

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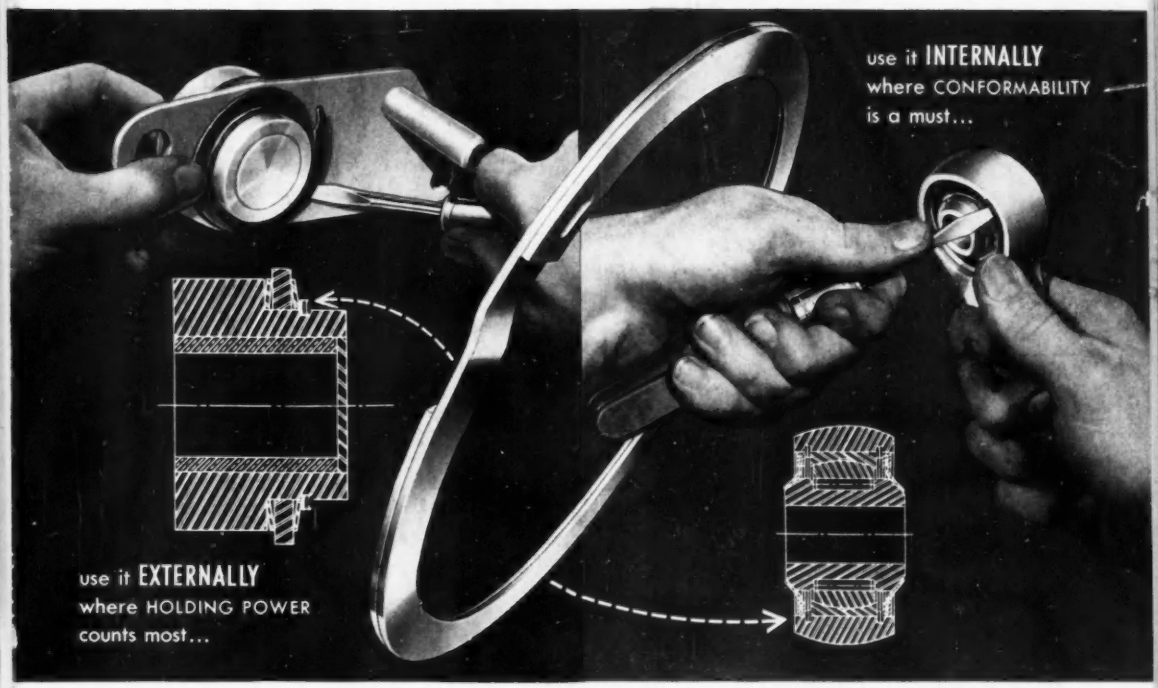
there are hundreds of ways in which Industry uses **SPIROLOX** to solve retaining problems



use "easy-in, easy-out" SpirOlox for compact design, removal of trouble-spots, elimination of costly machining and awkward parts!

The two application pictures above show how simply and effectively cylindrical parts assemblies are positioned and locked by Spirolox Retaining Rings in a toggle joint (right) and a friction clutch (left). Installed externally or internally, there's bearing surface all around . . . Spirolox conforms to the groove perfectly to resist centrifugal forces to a higher degree, and resist thrust forces up to its shear strength. In fact, because of its unique two-turn coil design, Spirolox will not jump the groove. Spirolox *stays put* because opening and closing force is resisted by friction created between the two turns. In operation, they are actually "squeezed" together to form a "friction lock!"

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FREE SPIROLOX SPECIFICATIONS CATALOG may help you build a product of greater simplicity and greater sales appeal, by eliminating awkward features and trouble spots. Your copy is waiting to point out how your retaining applications can be handled surer, quicker, more economically with SPIROLOX! Address request for your complimentary Spirolox Specifications Catalog to Ramsey Corporation, St. Louis 8, Mo.

Spirolox Retaining Rings are covered by United States Patent No. 2,450,425 and Foreign Patents. Other patents pending.

R5650

gapless • concentric • requires no special tools • easy-in, easy-out • re-usable • stays put